AIR DISPERSION MODELING REPORT FOR PSD PERMIT APPLICATION

Direct Coal Hydrogenation Facility
Spencer County, Indiana

Submitted to
Dispersion Modeling Lead
Indiana Department of Environmental Management's
Office of Air Quality (IDEM OAQ)
100 North Senate Avenue, Room N1003
Indianapolis, IN 46204

Prepared for
Riverview Energy Corporation

Prepared by
KBR
601 Jefferson Street
Houston, Texas 77002

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1.0 INTRODUCTION

The purpose of this document is to present the air dispersion modeling analysis, including the methodology and results, implemented as part of an air permit application submitted by Riverview Energy Corporation (Riverview Energy) to the Indiana Department of Environmental Management (IDEM). The subject of the air permit application will be Riverview Energy's proposed new Direct Coal Hydrogenation (DCH) facility that will convert coal to liquid fuels to be constructed near Dale, Indiana in Spencer County.

The objective of this document is to detail the proposed air emission sources and present the results of the refined modeling conducted to predict ambient concentrations of criteria pollutants resulting from those facility emissions. This document does not address air dispersion modeling of greenhouse gases (modeling not required by IDEM).

In revision 1 of this report the modeling results for PM10 and PM2.5 have been updated to reflect the elimination of particulate matter (PM) emissions from the operations of the coal pile and coal handling equipment, by providing dome enclosures. Additional PM emission sources from the Riverview Energy facility, as identified in the attached Modeling Protocol, were included in the model. Existing sources from Indiana and Kentucky were also included for NAAQS modeling.

In revision 2 of this report the modeling results for PM were updated to reflect conservative emission estimates for baghouse fabric filters, maximum planned flaring events potentially impacting short term NAAQS for CO, NO2, and SO2 emissions, updated toxicological screening results to include Totally Enclosed Waste Water Treatment System Vent, and updating regional background concentration levels.

2.0 SUMMARY OF MODELING RESULTS

A summary of the quantitative modeling results for criteria pollutants for the facility normal operations is provided in the following table 2-1. In regard to de-minimus or significant impact level (SIL) screening values, the following results are noted:

- The modeled annual impacts for NO2 and SO2 are below the applicable SIL values, while that for PM2.5 exceeded its annual SIL value.
- The modeled 24 hr impact for PM10 is below its applicable SIL values, while SO2 and PM2.5 exceeded their 24 hr SIL values.

- The modeled 8 hr impacts for CO are below its applicable SIL value.
- The modeled 3 hr impacts for SO2 are below its applicable SIL value.
- The modeled 1 hr impacts for CO are below its applicable SIL value, while those for NO2 and SO2 exceeded their applicable SIL values.

In regard to modeled impacts versus National Ambient Air Quality Standards (NAAQS) plus background concentrations, all results were well within the NAAQS, as seen in table 2-2. Additionally, modeled impacts versus PSD Class II Increments ranged from 2-18%.

In regard to potential hazardous air pollutant and visibility impacts, modeling following IDEM and EPA guidance showed no significant impacts, further supporting the finding of minimal expected impact of the DCH facility on local air quality.

Additional modeling was conducted for short term planned flaring events potentially impacting NAAQS for CO, NO2, and SO2. A summary of the results are provided in table 2-3 for each pollutant for the flaring event with the maximum impact on air quality. The following results are noted:

- For CO emissions, the planned flaring event that had the maximum predicted ground level concentration was during the Reformer Venting from the Hydrogen Plant 2 Commissioning and Cold Start-ups. The modeled 1 hr and 8 hr impacts for CO were below its applicable SIL value. Therefore, no additional NAAQS modeling was conducted.
- For NO2 emissions, the planned flaring event that had the maximum predicted ground level concentration was during the VCC Unit LPH Commissioning and Cold Start-ups Purging. The modeled 1 hr impact for NO2 exceeded its 1 hr SIL value.
- For SO2 emissions, the planned flaring event that had the maximum predicted ground level concentration was during the VCC Unit Product Stripper Commissioning and Cold Start-ups Purging. The modeled 1 hr, 3 hr, and 24 hr impacts for SO2 exceeded their respective SIL values.

In regard to modeled impacts for planned flaring events versus National Ambient Air Quality Standards (NAAQS) plus background concentrations for NO2 and SO2, all results were well within the NAAQS, as seen in table 2-4.

Table 2-1: Summary of Modeling Results for Riverview Sources without Other Existing Sources

Pollutant	Averaging Period	Rank	Modeled Ground-level Conc. (µg/m3)	Significant Impact Level (SIL) (µg/m3)	Modeled vs SIL	Background Conc. (µg/m3)	Modeled + Background Impact (µg/m3)	NAAQS (µg/m3)	Estimated Impact vs NAAQS	PSD Class II Increment (µg/m3)	Modeled vs PSD Increment
NO_2	Annual	H1H	0.7279	1	72.8%	15	15.73	100	15.7%	25	3%
	1-hr	H1H	15.1547	7.5	202.1%	-	-	-	-	-	-
		H8H	11.4879	-	-	67.68	79.17	188.6	42.0%	-	-
SO_2	Annual	H1H	0.4283	1	42.8%	3.6	4.03	80	5.0%	20	2%
	1-hr	H1H	15.5276	7.8	199.1%	-	-	-	-	-	-
		H4H	14.5387	-	-	33	47.54	196.2	24.2%	-	-
	3-hr	H1H	14.4583	25	57.8%	-	-	-	-	-	-
		H2H	14.2107	-	-	22.6	36.81	1300	2.8%	512	3%
	24-hr	H1H	5.0841	5	101.7%	-	-	-	-	-	-
		H2H	4.8242	-	-	11.1	15.82	365	4.3%	91	5%
$PM_{2.5}$	Annual	H1H	0.3280	0.3	109.3%	8.7	9.03	12	75.2%	4	8%
	24-hr	H1H	1.7051	1.2	142.1%	-	-	-	-	-	-
		H2H	1.5780	-	-	-	-	-	-	9	18%
		H8H	1.2125	-	-	19	20.21	35	57.7%	-	-
PM_{10}	24-hr	H1H	4.9626	5	99.3%	-	-	-	-	-	-
		H6H	3.1595	-	-	31	34.25	150	22.8%	30	11%
CO	1-hr	H1H	20.9654	2000	1.0%	-	-	-	-	-	-
		H2H	19.2304	-	-	1908.3	1927.53	40000	4.8%	-	-
	8-hr	H1H	13.4179	500	2.7%	-	-	-	-	-	-
		H2H	12.3979	-	-	1259.5	1271.90	10000	12.7%	-	-

Table 2-2: Summary of Modeling Results including Other Existing Sources showing impacts on NAAQS and PSD Increments within Riverview Energy Project's SIA

Pollutant	Averaging Period	Rank	Modeled Ground-level Conc. (µg/m3)	Background Conc. (µg/m3)	Modeled + Background Impact (µg/m3)	NAAQS (µg/m3)	Estimated Impact vs NAAQS	PSD Class II Increment (µg/m3)	Modeled vs PSD Increment
NO_2	1-hr	H8H	70.9485	67.68	138.63	188.6	73.5%	-	-
SO_2	1-hr	H4H	111.7275	33	144.73	196.2	73.8%	-	-
	24-hr	H2H	27.6823	11.1	38.68	365	10.6%	91	30.0%
PM2.5	Annual	H1H	0.8634	8.7	9.56	12	79.7%	4	22.0%
	24-hr	H8H	2.8937	19	21.89	35	62.6%	-	-

Table 2-3: Summary of Modeling Results for Planned Flaring Events from Riverview Facility without Other Existing Sources

Pollutant	Averaging Period	Rank	Modeled Ground-level Conc. (µg/m3)	Significant Impact Level (SIL) (µg/m3)	Modeled vs SIL	Background Conc. (µg/m3)	Modeled + Background Impact (µg/m3)	NAAQS (µg/m3)	Estimated Impact vs NAAQS	PSD Class II Increment (µg/m3)	Modeled vs PSD Increment
Flaring Event 1: Hydrogen Plant-2 Commissioning and Cold Startup – Reformer Vent – Maximum Impact for CO											
CO	1-hr	H1H	38.7649	2000	1.9%	-	-	-	-	-	-
		H2H	34.9170	-	-	1908.3	1943.22	40000	4.9%	-	-
	8-hr	H1H	20.7291	500	4.1%	-	-	-	-	-	-
		H2H	18.7696	-	-	1259.5	1278.27	10000	12.8%	-	-
Flaring Event 2: LPH Commissioning and Cold Startup Purging – Maximum Impact for NO2											
NO_2	1-hr	H1H	10.9224	7.5	145.6%	-	-	-	-	-	-
		H8H	7.6484	-	-	67.68	75.33	188.6	39.9%	-	-
Flaring Event 3: Product Stripper Commissioning and Cold Startup Purging – Maximum Impact for SO2											
SO_2	1-hr	H1H	36.5130	7.8	468.1%	-	-	-	-	-	-
		H4H	29.6650	-	-	33	62.66	196.2	31.9%	-	-
	3-hr	H1H	31.3870	25	125.5%	-	-	-	-	-	-
		H2H	30.5798	-	-	22.6	53.18	1300	4.1%	512	6%
	24-hr	H1H	10.7589	5	215.2%	-	-	-	-	-	-
		H2H	10.2829	-	-	11.1	21.38	365	5.9%	91	11%

Table 2-4: Summary of Modeling Results for Flaring Scenarios including Other Existing Sources showing impacts on NAAQS and PSD Increments within Riverview Energy Project's SIA

Pollutant	Averaging Period	Rank	Modeled Ground-level Conc. (µg/m3)	Background Conc. (µg/m3)	Modeled + Background Impact (µg/m3)	NAAQS (µg/m3)	Estimated Impact vs NAAQS	PSD Class II Increment (µg/m3)	Modeled vs PSD Increment
Flaring Event 2: LPH Commissioning and Cold Startup Purging – Maximum Impact for NO2									
NO_2	1-hr	H8H	70.9468	67.68	138.63	188.6	73.5%	-	-
Flaring Event 3: Product Stripper Commissioning and Cold Startup Purging – Maximum Impact for SO2									
SO_2	1-hr	H4H	111.8147	33	144.81	196.2	73.8%	-	-
	3-hr	H2H	103.3288	22.6	125.93	1300	9.7%	512	20.0%
	24-hr	H2H	27.692	11.1	38.79	365	10.6%	91	30.0%

3.0 PROJECT DESCRIPTION

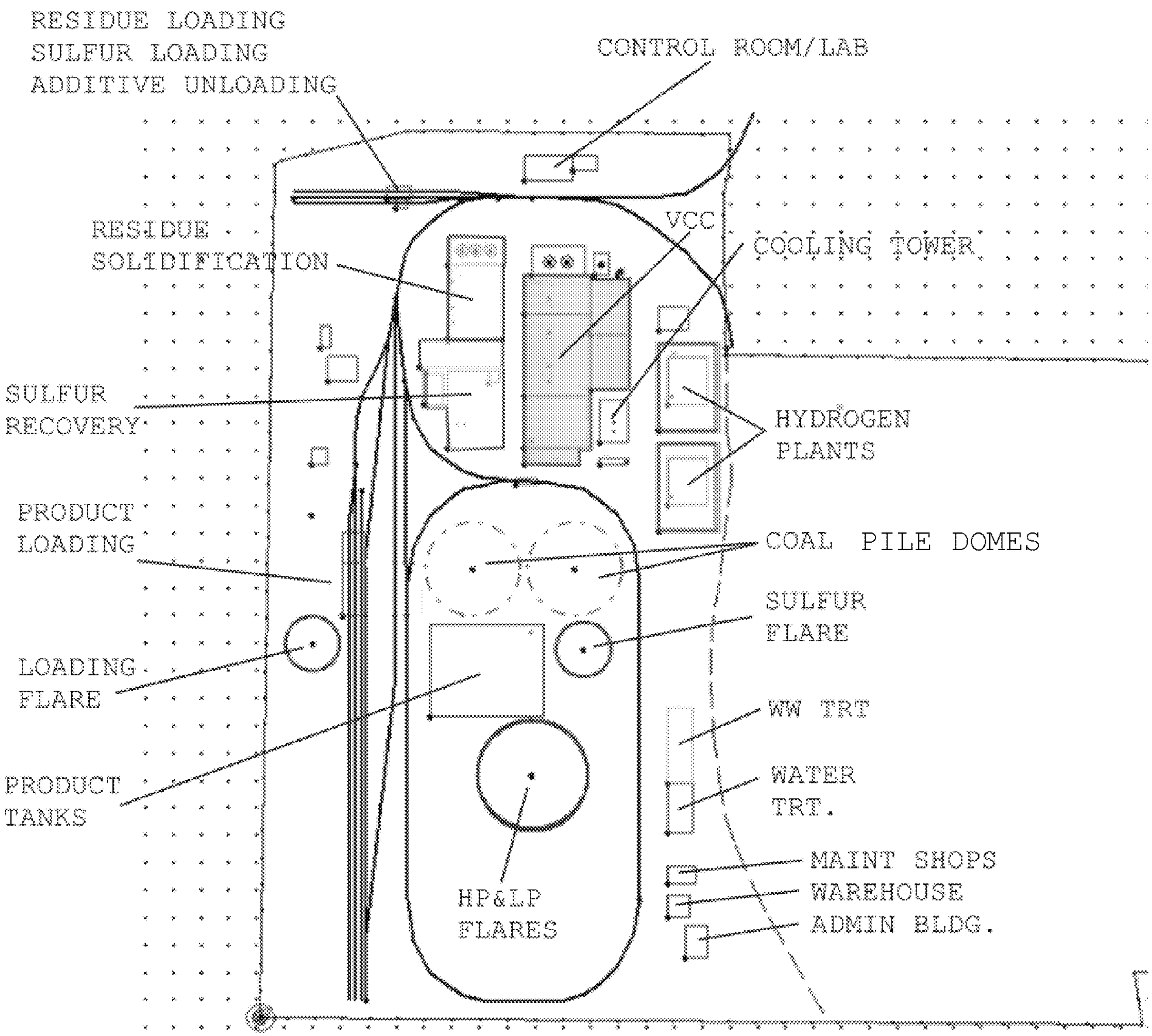
Riverview Energy will develop an industrial complex to convert 200 dry metric tons per hour of Indiana Number 5 high sulfur coal primarily into ultra-low-sulfur liquid fuel products (diesel and naphtha), as well as other saleable co-products (sulfur, ammonia and solid residue). The DCH facility complex will be located near Dale, IN. The subject property is a greenfield site of 547 acres just south of Interstate Highway 64, and east of US Highway 231, and approximately a mile northeast of Dale. The site is bounded by County Rd 2100N on the north of the property, E County Rd 2000N to the south and N Country Rd 500E to the east; farmland separates the Riverview Energy site from N Washington St on the west. The northeast corner of the general property block is occupied by Winkler, Inc., Cates & Cronin Investments, LLC., and a private landowner (Larry J. Gries).

A Norfolk Southern Railroad mainline running north-south across the site splits the Riverview Energy property into eastern and western halves. All the processing facilities including coal and product handling will be located on the western side of the property. The eastern side of the property has no currently proposed industrial development and may be used for supporting the DCH facility's construction activities.

The Riverview DCH processing facility will be comprised of a VCC process unit for coal conversion, feed handling and storage systems, a Sulfur Recovery Plant with associated Amine Regeneration and Sour Water Stripping, a VCC residue solidification unit and supporting flare systems, raw water, steam, cooling water, plant air/nitrogen, and wastewater facilities, as well as storage tanks and product shipping facilities. Additionally, a third-party hydrogen production facility with two units using a mix of VCC supplied feedstock and natural gas will be located onsite to supply the VCC's hydrogen demand.

For coal and rail shipping logistics, a rail loop with coal unloading to coal piles, spurs for additive unloading and product loading, and a staging rail yard will be constructed. Raw materials and products are primarily transported into and out of the DCH facility via rail, with only ammonia byproduct being routinely trucked out of the complex. The process areas are shown in Figure 3-1.

FIGURE 3-1



4.0 AIR DISPERSION MODELING

The Riverview DCH facility has the potential to emit greater than 100 tons per year (TPY) of NOx, CO, SO2 and VOC, greater than 25 TPY for PM10 and PM2.5, and greater than 100,000 tons per year of greenhouse gas emissions. The facility emissions will exceed the Prevention of Significant Deterioration (PSD) significance thresholds (ref: 326 IAC 2-2-1) and, therefore, air quality dispersion modeling is required. The dispersion modeling was used to determine the ambient air compliance status of any impacts associated with operation of the planned facility.

The modeling was used to determine:

- Any significant impacts from the Riverview Energy sources
- Extent of the significant impacts
- Need for project modeling to include offsite source inventories
- Comparison of modeled Riverview Energy impacts with appropriate standards and increments
- Documentation of any additional impacts

The guidelines and basis of the modeling analyses including the modeling software used, modeling domain, terrain information, meteorological data, source characterization, and source inventories are detailed in the revision C of the Air Dispersion Modeling Protocol which is included as Attachment B to this report.

All aspects of the air dispersion modeling analysis submitted to IDEM as part of Riverview Energy's PSD permit application package aligns with IDEM requirements for air dispersion modeling for PSD permits.

4.1 Modeling Analysis

4.1.1 Modeling of Criteria Pollutants

Based on the total potential to emit for the following pollutants exceeding significant emission rates per IDEM, Riverview Energy performed air dispersion modeling for the pollutants and averaging periods identified below for the emissions sources.

- NO2 – 1-hr, Annual
- SO2 – 1-hr, 3-hr, 24-hr, Annual
- PM2.5 – 24-hr, Annual
- PM10 – 24-hr
- CO – 1-hr, 8-hr

The results of the Riverview air dispersion modeling are shown in Tables 2-1 and 2-2, along with applicable thresholds and ambient standards and increments. The locations of the modeled concentrations in UTM coordinates are also provided. Because of the relatively low emission rates due to the types of processes and emission controls applied, the modeled ambient concentrations are near or below the respective significant impact levels (SIL) suggesting that the project will have little effect on local ambient air quality in the vicinity of the Riverview site.

Those pollutants and averaging periods with modeled concentrations less than the respective SIL are exempted from further assessment. This exemption is based on the definition of the SIL as that value, above which could "cause or contribute" to a modeled exceedance of an ambient standard or increment level.

As shown in Table 2-1, modeled concentrations for the pollutants CO, PM10, and PM2.5 are less than their respective SIL values and therefore no further analysis was required for CO, PM10, and PM2.5. Similarly, the annual impact for NO2, and impacts for 3-hour and annual SO2 are less than their respective SILs. Therefore no further assessment of the impacts for those pollutants and averaging periods was required.

For any modeled pollutant/averaging period combination with an ambient modeled concentration potentially exceeding the respective SIL, the significant impact area (SIA) was determined. The SIA was then used to determine the necessity of acquiring and modeling an off-site emission inventory of sources for comparison to applicable PSD Increments, as well as to ambient air quality standards.

The SIA for the 1-hour NO2 impacts, and 1- and 24-hour SO2 impacts are within 10 km of the Riverview fenceline.

Additional modeling with the inclusion of off-site (or other) sources as described in the attached Modeling Protocol (see Attachment B) was conducted to determine the impact on NAAQS and PSD increment within the Riverview facility's SIA.

As shown in Table 2-2, there was no significant impacts within the Riverview Project's SIA on the NAAQS and PSD increments for 1-hour NO2, and 1- and 24-hour SO2 concentrations.

4.1.2 Modeling of Hazardous Air Pollutants (HAPs)

As identified in the Modeling Protocol document, a total of ten (10) hazardous air pollutants (HAPs) along with hydrogen sulfide and ammonia emissions from the Riverview facility were identified and modeled towards toxicological analysis.

The toxic screening assessment was performed assuming an acute (short term) and a chronic (long term) exposure duration. For the acute risk evaluation, a 24-hour modeled concentration was used, and for the chronic risk evaluation an annual average modeled concentration was used.

The screening analysis was conducted for non-cancer (acute and chronic) risk evaluation for all applicable HAPs, and cancer risk screenings for carcinogenic HAPs.

Toxicological dose response information used from the analysis was sourced from IDEM's website.

The results of the analyses are provided in the table 4-1.

Non-Cancer Acute Screening

The 24-hour modeling results for non-carcinogenic HAP compounds are below the appropriate acute Minimum Risk Level (MRL) for each compound, with no appreciable risk of adverse non-cancer health effects to humans from a daily short-term exposure of 1 to 14 days.

Non-Cancer Chronic Hazard Screening

As part of the non-cancer chronic hazard screening, the modeled annual concentration for each HAP compound was compared with the appropriate Inhalation Reference Concentration (RfC) to obtain the Hazard Quotient (HQ), using the following equation:

Hazard Quotient = Modeled Concentration / Reference Concentration

The cumulative effects of multiple non-carcinogenic HAPs is represented by the total Hazard Index (HI) which is a summation of individual HQs. The analyses show that the HQs and the total HI is below a value of one and therefore, no reasonable adverse health effects would occur due to exposure solely from the HAP emissions from the Riverview facility.

Cancer Risk Screening

To compute cancer risks for the individual HAPs that are considered carcinogenic, the maximum modeled annual concentration for each compound was multiplied with its corresponding UnIt Risk Factor (URF) to estimate the potential incremental cancer risk for an individual

Risk = Annual Concentration x Unit Risk Factor

The cumulative cancer risk for the Riverview facility was computed by summing the cancer risk posed by each carcinogenic HAP and was found to be less than the 1×10^{-6} threshold and therefore not a concern per the IDEM risk assessment methodology.

Table 4-1: Toxicological Screening Analysis for HAPs, Hydrogen Sulfide and Ammonia

Pollutant	CAS Number	Acute		Chronic							
		Modeled 24-Hour Conc (µg/m3)	24-hour MRL (ug/m3)	Modeled Annual Conc (ug/m3)	Cancer URF, $(ug/m3)^{-1}$	Source	Cancer Risk	Non-Cancer Chronic RfC, ug/m3	Source of IDEM RfC	Hazard Quotient (HQ)	Target Organs / Inhalation Critical Effects
Methanol	67561	8.2957		1.31				**20000.00**	IRIS	6.57E-05	
Hexane	110543	1.2214	**2100**	0.15				**700.00**	IRIS	2.15E-04	Neurological (PNS)
Formaldehyde	50000	0.0055	**49**	0.0008	1.3E-05	IRIS	1.06E-08	**9.80**	ATSDR	8.34E-05	Respiratory system
Toluene	108883	1.2379	**3700**	0.15				**5000.00**	IRIS	3.05E-05	Neurological (CNS)
Benzene	71432	0.7061	**160**	0.0737	7.8E-06	IRIS	5.75E-07	**30.00**	IRIS	2.46E-03	*Inhalation Carcinogen*
Nickel	7440020	0.0002	---	2.29E-05	2.4E-04	IRIS	5.49E-09	**0.20**	ATSDR	1.14E-04	*Inhalation Carcinogen*
Ammonia	7664417	11.7695	**1200**	1.86				**100.00**	IRIS	1.86E-02	*Pulmonary, Respiratory system*
H2S	7783064	0.2594	**280**	0.03				**2.00**	IRIS	1.69E-02	*Nasal passages*
Xylenes	1330207	1.5515	**4300**	0.19				**100.00**	IRIS	1.91E-03	*Neurological (CNS)*
Phenol	108952	0.0165		0.002				**200.00**	CAL	1.02E-05	*Respiratory system, Liver, Kidneys*
o-Cresol (2-Methylphenol)	95487	0.0330		0.004				**175.00**	Region 9	2.32E-05	
m-, p-Cresols	1319773	0.0165		0.002				**600.00**	CAL	3.39E-06	
					Cumulative Cancer Risk =		0.591E-06	**Total Hazard Index (HI) =**		**0.0404**	
					IDEM compliance metric =		< 1E-06			< 1	

4.1.3 Additional Impact Assessments

Visibility Impairment Analysis

A visual impact analysis was completed to assess the potential effect of project emissions on visibility at any nearby sensitive areas as well as farther distant Class I areas.

The Federal Land Managers' Air Quality Related Values Work Group (FLAG) Phase 1 Report – Revised (2010) was reviewed for the long range visibility analysis at Class I Areas. The nearest Class I area to the Riverview Energy site at Dale, IN, is Mammoth Cave National Park, Kentucky, located approximately 120 km from the proposed Riverview Energy project location. As recommended by FLAG, a Q/D test was conducted for the proposed Riverview project to determine whether or not any further visibility analysis is necessary, where Q/D≤10 does not warrant further analyses. Q is the total SO2, NOx, PM10, and H2SO4 annual emissions from the project (in tons per year, based on 24-hour maximum allowable emissions), and D is the distance (in kilometers) from the Class I area.

Q/D analysis for Riverview is shown in the table 4.2.

Table 4-2: Q/D Analysis

Emissions from Riverview Energy Project:

Pollutants	lb/hr	tpy
NOx	80.84	354.08
SO2	28.15	123.30
PM10	16.22	71.04
H2SO4	3.88	16.99
Total	129.1	565.4
Q =	**565.4**	**tpy**

Distance to nearest Class 1 Area:

S.No.	Class 1 Area	Distance (D), km	Q/D	Is Q/D ≤ 10?	Additional Visibility Analysis Required
1	Mammoth Cave National Park, KY	120	4.8	Yes	No

As requested by the National Park Service, a visibility assessment was completed for the Lincoln Boyhood National Memorial (LIBO) which is located 8 km south of the proposed Riverview Energy project facility. The visibility assessment was conducted by modeling the project emissions in the EPA VISCREEN model and comparing the impacts to certain thresholds. The results of the VISCREEN model are provided in Attachment A.

Soil and Vegetation Analysis

A general soil analysis from the nearby area indicates clay and sandy clay over sandstone and shale.

Due to the agricultural nature of the land, crops in the Spencer County area, near Dale, IN and in nearby areas in adjoining counties of Warrick, Dubois and Pike, consist mainly of corn, soybean, wheat, and hay (2015 Cropland Data, USDA's National Agricultural Statistical Service Indiana Field Office).

The maximum modeled concentrations for the proposed Riverview Energy facility are well below the NAAQS and the threshold limits necessary to have adverse impacts on the surrounding vegetation such as autumn bent, nimblewill, barnyard grass, bishop's cap, horsetail, and milkweed (Flora of Indiana – Charles Deam). The main livestock in Spencer County consist mainly of turkeys, hogs, and cattle (2012 USDA Agricultural Census for Spencer County, IN) and will not be adversely impacted from the facility. Trees in the area are mainly hardwoods. These are hardy trees and no significant adverse impacts are expected due to modeled concentrations.

Federal endangered species are listed by the U.S. Fish and Wildlife Service, Division of Endangered Species for Indiana for 2017, and include 4 birds, 10 fishes, 3 mammals, 11 mussels, 2 reptiles, 3 insects and 6 plants. Of the federal and state endangered species on the list, 2 mussels (Rabbitsfoot *Quadrula cylindrica cylindrica* and Sheepnose *Plethobasus cyphyus*), 1 bird (Least tern *Sternula antillarum*), and 3 mammals (Gray bat *Myotis grisescens*, Indiana bat *Myotis sodalis*, and Northern long-eared bat *Myotis septentrionalis*) have habitat within Spencer County. The listed mussels, birds and mammals are found along the rivers and lakes, and in caves near the water bodies and wooded areas. The facility is not expected to have any additional adverse effects on the habitats of the species than what has already occurred from the farming, residential, and industrial activities in the area. At this time no federally endangered plant species are found in Spencer County, IN. The endangered plants do not thrive in industrialized and residential areas. The facility is not expected to adversely affect any plant on the endangered species list.

Growth Analysis

It is estimated that approximately 200 additional jobs will be created as a result of the proposed project. Most of the employees will be drawn from surrounding areas. Since the area is predominately rural, it is not expected the growth impacts will cause a violation of the NAAQS or the PSD increment. The additional money injected into the local economy by these jobs will encourage local commercial growth at no cost to other areas. The facility will not hinder other industrial growth in the area, and the Applicant will be potential customer for industrial suppliers of equipment, construction services, materials and transportation.

Attachment A – Results of VISCREEN Modeling

Visual Effects Screening Analysis for
Source: Riverview Energy Corp, Dale IN
Class I Area: Lincoln Boyhood National Monument, Lincoln City IN

*** Level-1 Screening ***
Input Emissions for

Particulates	16.22	LB /HR
NOx (as NO2)	80.84	LB /HR
Primary NO2	0.00	LB /HR
Soot	0.00	LB /HR
Primary SO4	3.88	LB /HR

**** Default Particle Characteristics Assumed

Transport Scenario Specifications:

Background Ozone:	0.04	ppm
Background Visual Range:	20.00	km
Source-Observer Distance:	8.00	km
Min. Source-Class I Distance:	8.00	km
Max. Source-Class I Distance:	10.00	km
Plume-Source-Observer Angle:	11.25	degrees
Stability:	6	
Wind Speed:	1.00	m/s

R E S U L T S

Asterisks (*) indicate plume impacts that exceed screening criteria

Maximum Visual Impacts INSIDE Class I Area
Screening Criteria ARE Exceeded

					Delta E		Contrast	
Backgrnd	Theta	Azi	Distance	Alpha	Crit	Plume	Crit	Plume
SKY	10.	133.	10.0	36.	2.00	3.248*	0.05	0.005
SKY	140.	133.	10.0	36.	2.00	1.283	0.05	-0.022
TERRAIN	10.	84.	8.0	84.	2.01	3.177*	0.05	0.031
TERRAIN	140.	84.	8.0	84.	2.00	0.618	0.05	0.019

Maximum Visual Impacts OUTSIDE Class I Area
Screening Criteria ARE Exceeded

					Delta E		Contrast	
Backgrnd	Theta	Azi	Distance	Alpha	Crit	Plume	Crit	Plume
SKY	10.	10.	3.8	159.	2.00	4.694*	0.05	0.010
SKY	140.	10.	3.8	159.	2.00	1.716	0.05	-0.036
TERRAIN	10.	2.	1.0	167.	2.00	8.689*	0.05	0.110*
TERRAIN	140.	2.	1.0	167.	2.00	2.214*	0.05	0.099*

Note: The above results are for stability class 6 (F) with very low wind speeds (≤ 1m/s) which is usually at night time or at pre-dawn conditions before sunrise initiates atmospheric turbulence. The visual impacts are expected to be much lower at more unstable and neutral conditions (stability class C or D).

Attachment B – Air Dispersion Modeling Protocol

AIR DISPERSION MODELING PROTOCOL FOR PSD PERMIT APPLICATION

Direct Coal Hydrogenation Facility
Spencer County, Indiana

Submitted to
Dispersion Modeling Lead
Indiana Department of Environmental Management's
Office of Air Quality (IDEM OAQ)
100 North Senate Avenue, Room N1003
Indianapolis, IN 46204

Prepared for
Riverview Energy Corporation

Prepared by
KBR
601 Jefferson Street
Houston, Texas 77002

TABLE OF CONTENTS

1.0 INTRODUCTION

The purpose of this document is to present the air dispersion modeling analysis or protocol proposed to be implemented as part of an air permit application submitted by Riverview Energy Corporation (Riverview Energy) to the Indiana Department of Environmental Management (IDEM). The subject of the air permit application will be Riverview Energy's proposed new Direct Coal Hydrogenation (DCH) facility that will convert coal to liquid fuels to be constructed near Dale, Spencer County, Indiana.

The objective of this document is to detail the proposed air emission sources and present the refined modeling procedures to be used to predict ambient concentrations of criteria pollutants resulting from those facility emissions. This document does not address air dispersion modeling of greenhouse gases (modeling not required by IDEM).

2.0 PROJECT DESCRIPTION

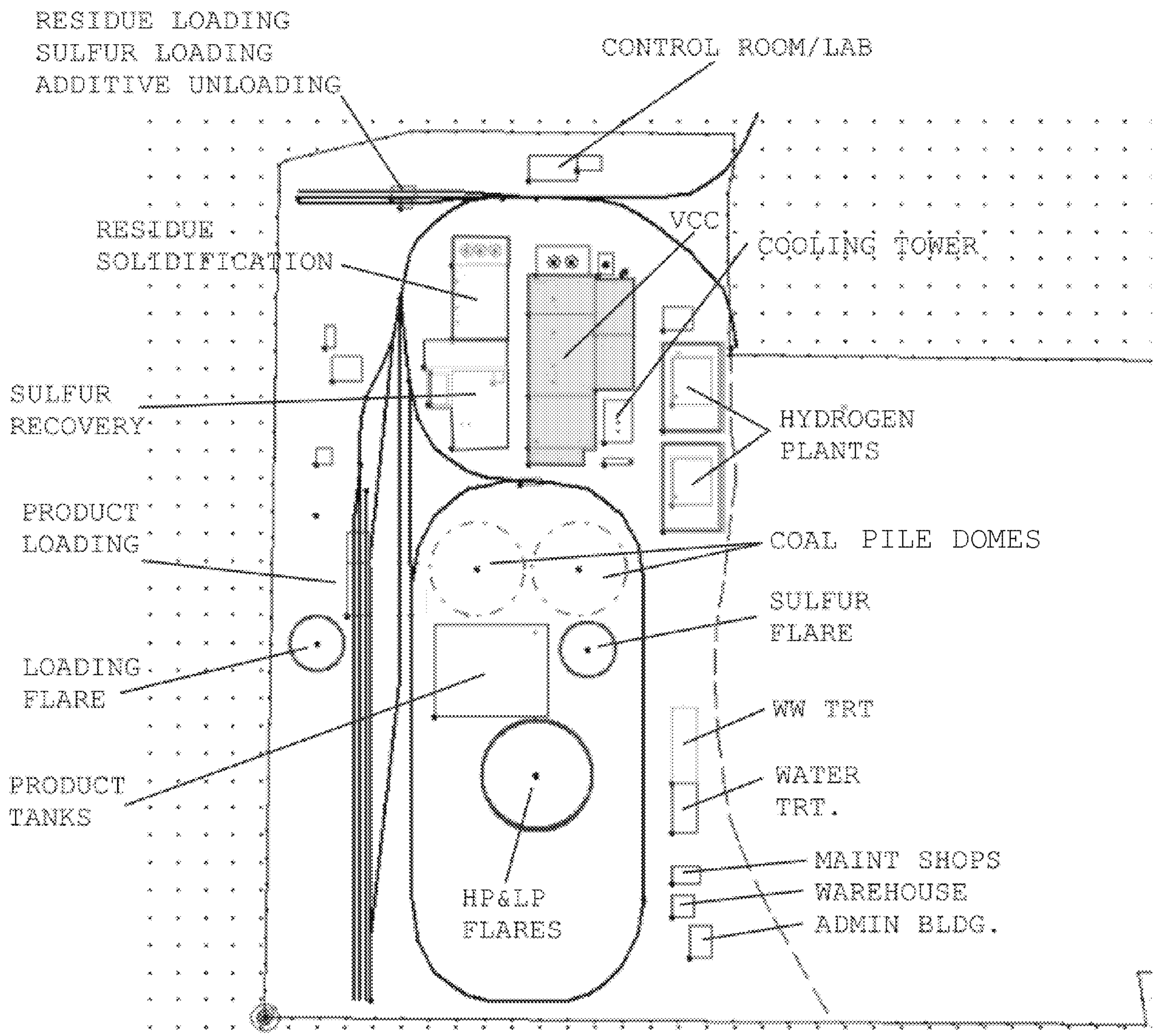
Riverview Energy will develop an industrial complex to convert 200 metric tons per hour of Indiana Number 5 high sulfur coal primarily into ultra-low-sulfur liquid fuel products (diesel and naphtha), as well as other saleable co-products (sulfur, ammonia and solid residue). The complex will be located near Dale, IN. The subject property is a greenfield site of 547 acres just south of Interstate Highway 64, and east of US Highway 231, and approximately a mile northeast of Dale. The site is bounded by County Rd 2100N on the north of the property, E County Rd 2000N to the south and N Country Rd 500E to the east; farmland separates the Riverview Energy site from N Washington St on the west. The northeast corner of the general property block is occupied by Winkler, Inc., Cates & Cronin Investments, LLC., and a private landowner (Larry J. Gries). See attachment A.

A Norfolk Southern Railroad mainline running north-south across the site splits the Riverview Energy property into eastern and western portions. All the processing facilities including coal and product handling will be located on the western side of the property. The eastern side of the property has no proposed industrial development.

The Riverview Energy facility will comprise of a VCC process unit for coal conversion, feed handling and storage systems, a Sulfur Recovery Plant and associated Amine Regeneration and Sour Water Stripping, flares, raw water steam, cooling water and wastewater facilities, as well as storage tanks and product shipping facilities. Additionally, a hydrogen manufacturing plant operated by a third party will be located onsite to supply the complex's hydrogen demand. For coal and rail deliveries, a rail loop with unloading and staging spurs areas will be constructed. Raw materials and products are primarily transported via rail, with ammonia byproduct being trucked out of the complex.

The process areas shown in Figure 2-1 include a number of different processes, all designed to support the fuel conversion process. Coal will be brought to the site via railcar and liquid products will be loaded and shipped offsite.

FIGURE 2-1



3.0 AIR DISPERSION MODELING

The Riverview Energy DCH facility has the potential to emit greater than 100 TPY of NOx, CO, SO2 and VOC, greater than 25 TPY for PM10 and PM2.5, and greater than 100,000 tons per year of greenhouse gas emissions. The facility emissions will exceed the Prevention of Significant Deterioration (PSD) significance thresholds (ref: 326 IAC 2-2-1) and, therefore, air quality dispersion modeling will be required. The dispersion modeling will be used to determine the ambient air compliance status of any impacts associated with operation of the planned facility.

The modeling will be used to determine:

- Any significant impacts from the Riverview Energy sources

- Extent of the significant impacts
- Need for project modeling to include offsite source inventories
- Comparison of modeled Riverview Energy impacts with appropriate standards and increments
- Documentation of any additional impacts

A modeling report describing the methodology and results of the modeling will be provided as part of the air quality permit application submitted to IDEM.

The guidelines and basis of the modeling analyses are detailed in the following sections of this document. All aspects of the air dispersion modeling analysis submitted to IDEM as part of Riverview Energy's PSD permit application package will align with IDEM requirements for air dispersion modeling for PSD permits.

3.1 Modeling Methodology

3.1.1 Dispersion Model

Dispersion modeling will be performed using the latest version of AERMOD, available through the BEE-Line Software Co. BEEST for Windows Suite (latest BEEST Version is 11.09/ AERMOD Version 16216r). All regulatory default options in AERMOD are used for modeling analysis. Other modeling components utilized include the following:

3.1.2 Source Characterization

The Riverview site topography is shown in Attachment B. The property relief shows significant elevation change across the site. The railroad access and loop elevation is currently set at 485 feet above mean sea level, and controls the main process area elevations, i.e. being used for grade elevation.

The DCH facility is comprised of process, offsites, utilities and support buildings with a main rail loop for coal and train logistics and additional rail yard spurs for product loading and railcars staging. A set of block flow diagrams (BFDs) for the facility is provided as Attachment C. The facility is divided into functional blocks and air emissions sources are labelled with Emission Unit numbers as presented in Table 3-1.

Table 3-1

Block	Emission Unit Number	Emission Source	PM10/ PM2.5	NOx	CO	SO2	VOCs	HAPs
1000	EU-1000	Coal Unloading Station	X	--	--	--	--	--
	EU-1001	Transfer Station 1	X	--	--	--	--	--
	EU-1006	Reclaim Transfer Station	X	--	--	--	--	--
	EU-1007	Coal Dryer Heater	X	--	--	--	--	--
	EU-1008	Coal Drying Loop Purge	X	--	--	--	--	--
1500	EU-1501	Coarse Additive Storage Filter	X	--	--	--	--	--
	EU-1502	Fine Additive Storage Filter	X	--	--	--	--	--
	EU-1503	NA2S Additive Storage Filter	X	--	--	--	--	--
	EU-1504	Fine Additive Production System	X	--	--	--	--	--
2000	EU-2001	Feed Heater	X	X	X	X	X	X
	EU-2002	Treat Gas Heater	X	X	X	X	X	X
	EU-2003	Vacuum Column Feed Heater	X	X	X	X	X	X
	EU-2004	Fractionator Feed Heater	X	X	X	X	X	X
	EU-2005	Coal Handling System Filter	X	--	--	--	--	--
	EU-2006	Coarse Additive Handling System Filter	X	--	--	--	--	--
	EU-2007	Fine Additive Handling System Filter	X	--	--	--	--	--
	EU-2008	Na2S Handling System Filter	X	--	--	--	--	--
3000	EU-3001	TGTU Stack A	X	X	X	X	X	X
	EU-3002	TGTU Stack B	X	X	X	X	X	X
4000	EU-4001	Loading Flare	X	X	X	X	X	X

Table 3-1									
Block	**Emission Unit Number**	**Emission Source**	**PM10/ PM2.5**	**NOx**	**CO**	**SO2**	**VOCs**	**HAPs**
	EU-4002	Sulfur Block Flare	X	X	X	X	X	X
	EU-4003	LP Flare	X	X	X	X	X	X
	EU-4004	HP Flare	X	X	X	X	X	X
5000	EU-5001A/B/C/D	Residue Pastilators Stack1	X	--	--	--	X	--
	EU-5002A/B/C/D	Residue Pastilators Stack2	X	--	--	--	X	--
	EU-5003A/B/C/D	Residue Pastilators Stack3	X	--	--	--	X	--
	EU-5004A/B/C/D	Residue Pastilators Stack4	X	--	--	--	X	--
	EU-5009	Residue Bulk Container Loading	X	--	--	--	X	--
	EU-5010	Residue Rail Silo Filter	X	--	--	--	X	--
	EU-5011	Residue Swing Silo Filter	X	--	--	--	X	--
6000	EU-6000	Package Boiler	X	X	X	X	X	X
	EU-6001	Cooling Tower Cell A	X	--	--	--	X	--
	EU-6002	Cooling Tower Cell B	X	--	--	--	X	--
	EU-6003	Cooling Tower Cell C	X	--	--	--	X	--
	EU-6005	EDG Diesel Tank	--	--	--	--	X	--
	EU-6006	Emergency Diesel Generator	X	X	X	X	X	X
	EU-6007	EDFWP Diesel Tank	--	--	--	--	X	--
	EU-6008	Emergency Diesel Fire Water Pump	X	X	X	X	X	X
	EU-6501	Lime Silo Filter	X	--	--	--	--	--
	EU-6502	Deaerator Vent	--	--	--	--	--	--

Table 3-1

Block	Emission Unit Number	Emission Source	PM10/ PM2.5	NOx	CO	SO2	VOCs	HAPs
7000	EU-7001	Hydrogen Plant 1 Reformer	X	X	X	X	X	X
	EU-7002	Hydrogen Plant 2 Reformer	X	X	X	X	X	X
	EU-7003	Hydrogen Plant 1 DA Vent	--	--	X	--	X	X
	EU-7004	Hydrogen Plant 2 DA Vent	--	--	X	--	X	X
8000	EU-8001	Totally Enclosed Wastewater Treatment System Vent	--	--	--	--	X	X

The source locations of the planned modeled emission sources are shown in Attachment D. The area will be fenced around its periphery and, therefore, the boundary shown will preclude public access.

Emission controls are being included in the process areas to reduce pollutant amounts entering the atmosphere. These emission controls include Leak Detection and Repair (LDAR) program for VOC fugitive emissions from process areas, dome enclosures for coal piles, coal stackers and reclaimers, and as well as enclosed materials handling areas. The calculated emission levels for modeling purposes conservatively apply the envisioned control technologies per process area.

The Riverview Energy facility is a new site project and, therefore, the modeling will be based on project design specifications. The source parameters associated with these emission points are provided in Attachment E. This represents PTE emissions for the facility operating at design conditions.

Three different source types are envisioned to assess the ambient air quality impacts from the proposed Riverview facility. These include, point, line, and volume source types as deemed necessary. The upper portion of the table in Attachment E includes the proposed point source parameters for the different point type sources that are part of the planned facility. Below that are the volume source parameters proposed to characterize the fugitive HAP emissions from the process areas, and product storage and handling areas which occur from a volume source type.

In regards to modeling roads inside the plant, there is very little routine truck traffic associated with raw materials or products, as rail transportation is predominantly used. The truck entrance on road 2100N is only 0.5 mile to the ammonia truck loading spot for which 5 truck per day equivalent expected; and the entrance is only 0.3 mile to the Na2S Silo for which 34 trucks per year are expected. No other regular product or feed material transport other than car and maintenance truck traffic are expected. The roadway segments will be modeled as line source types.

The emission rates associated with the various sources are also provided in the appropriate modeling emission units for the source type modeled. The point and volume source emissions shown are in units of grams per second (g/s), whereas the line source emissions shown are in units of grams per second per square meter (g/s/m2), which is appropriate for that type of source.

Of note in the point source parameters in the upper portion of table in Attachment E is the use of a "-6K" exhaust temperature for the cooling towers. The use of a negative temperature instructs the model to apply a positive 6 degrees to the hourly meteorological ambient temperature. The rationale for this approach is that cooling tower water is typically warmer than ambient and use of a static exit temperature or an ambient exit temperature may mischaracterize the difference in temperatures. Further, this approach precludes potential problems in hot summer temperatures when warm ambient temperatures could suggest that the cooling tower temperature was colder than ambient and no buoyancy is calculated by the model.

The remaining point source modeled parameters are typical for the types of point sources being modeled and are based on engineering design specifications. The flare parameters are based on EPA guidance for the calculation of effective diameters based on a fixed exhaust temperature (1273 K) and exit velocity (20 m/s). The effective diameter is then based on the formulaic determination of plume rise based on heat release rates from the flare volume.

The volume source parameters used to characterize the fugitive emissions parameters were calculated based on EPA guidance and the physical dimensions of the activity areas and depths.

The line source parameters for roadway emission characterizations were based on EPA guidance for the application of line sources. The beginning and ending line segment locations are used, together with the roadway width, to determine the road segment area. This is used to divide into the emission rate to calculate the appropriate modeled rate.

Modeling will be performed to assess impacts on ambient air quality on both a short-term and annual basis, as defined in Section 3.2.1. In each case, emission points sources listed in Attachment E will be modeled – for sources operating intermittently, IDEM guidance will be referenced to determine appropriate instances where such sources may be exempt from inclusion in air dispersion modeling.

3.1.3 Source Characterization for Intermittent Planned Flaring Events

In addition to modeling of normal operating conditions for the proposed facility as described in previous sections, intermittent planned flaring events from the facility will also be assessed for impacts to the ambient air quality through modeling, as requested by IDEM.

Planned flaring events are identified by Riverview, of which the three major flaring events with the maximum estimated emissions of CO, NOx, SO2 will be assessed for potential impact to ambient air quality. The three flaring events are:

- Event 1 (CO Max) – flaring of Reformer Vent gases to the LP Flare during the Hydrogen Plant-2 commissioning or cold start-ups (CCSU); up to 2 events per year, lasting 12 hours per event
- Event 2 (NOx Max) – flaring of purge gases to the HP Flare during the VCC Unit LPH during commissioning or cold start-ups (CCSU); up to 2 events per year, lasting 168 hours per event
- Event 3 (SO2 Max) – flaring of purge gases to the HP Flare during the VCC Unit Product Stripper commissioning or cold start-ups (CCSU); up to 2 events per year, lasting 48 hours per event

Source input parameters for modeling of the above listed planned flaring events are provided in Attachment J. For the Flare Tool in AERMOD, the Texas methodology will be used to determine the flare effective stack diameter and buoyancy flux, based on the input value parameters of flare heat release rate and flared gas molecular weight.

As the planned flaring events are expected to last only for few hours in a year, only short-term impact assessment to the ambient air quality, i.e. 1-hr, 3-hr, 8-hr and 24-hr, will be assessed for the above pollutants.

In developing these planned flaring events or scenarios, the emissions estimates indicated in Attachment J are accounted for the fact that the VCC unit will first target 50 percent design rate during commissioning or cold start-ups (CCSU). This is to establish that steady state operations can be maintained before ramping up to 100 percent design rate for systems testing and ultimately the VCC unit performance tests. Thus the following is expected:

- 0-50% rates will be seen at fired units as recirculating streams are heated, they could be averaged as being at 25%, but Riverview chose to evaluate at 50% for conservatism in this modeling analysis
- Only one Hydrogen plant or Sulfur Recovery Unit (SRU) needs to be operational to reach 50% rate target
- The SRU(s) will be fired on fuel gas and ready to receive acid gas feed streams from the Amine Recovery Unit's (ARU) and Sour Water Stripper's (SWS) initial operations as sulfur load from the VCC Unit increases. They were likewise conservatively evaluated at 50% for the modeling analysis
- Venting to flare will taper off as VCC rate approaches 50%

- The maximum heat release rates provided for the LPH CCSU and Product Stripper CCSU flaring events are not concurrent nor representative of the entire period of their flaring periods and are believed conservative
- The commissioning or cold start-up impact modeling of greatest interest is likely at between the 25 and 50% rate cases

Similarly for the Hydrogen Plant 2 Reformer CCSU flaring event for CO Max case, it is anticipated that:

- The VCC facility will be operational at 50% capacity, with the fired heaters operating at 50% firing rates
- The Hydrogen Plant 1 Reformer is operating at 100% capacity to support the VCC facility which is at 50% capacity
- The Hydrogen Plant 2 Reformer CCSU flaring event is not concurrent with the LPH CCSU and Product Stripper CCSU flaring events

3.1.4 Modeling Domain

Pollutant concentrations will be assessed using a receptor grid extending out to 10 km from the facility fenceline, and spacing of the receptors will be arranged as described below.

- 50 m along the facility fence line
- 50 m extending from the fence line to 0.5 km
- 100 m extending from 0.5 km to 1.5 km
- 250 m extending from 1.5 km to 3 km
- 500 m extending from 3 km to 10 km

Modeling a receptor grid extending beyond 10 km and up to 50 km out from the facility fenceline (at 500 m spacing) is not pursued as part of Riverview Energy's modeling for significant impact level (SIL) analysis. The full grid of receptors is depicted in Attachment F.

Where necessary, fine grids of 50-meter spacing may be created over areas of maximum modeled concentration of pollutants to ensure that a true maximum ground-level concentration has been identified after using the above grid spacing.

3.1.5 Terrain

3.1.5.1 Terrain Elevations

The AERMAP program provided by BEE-Line Software Co. with its latest BEEST for Windows Suite (BEEST Version 11.09, AERMAP Version 11103) will be utilized to process a terrain data file and assigning terrain heights to each receptor modeled.

The terrain data file available from IDEM for Spencer County (.TIF file type) is used in AERMAP to extract terrain elevations for receptors and bases for sources and buildings. This terrain data file is in the National Elevation Dataset (NED) format and is published data by United States Geological Survey (USGS) and provided by IDEM.

3.1.5.2 Land Use Determination (Urban/Rural)

The AERMOD model includes functionality to account for the affects increased surface heating in largely developed areas by selecting a model option for "urban" site locations. The Riverview Energy facility is to be located in a rural area with few nearby sources of air emissions, so the urban area modeling option will not be selected; this is in accordance with the recommendation of IDEM in its modeling guidance document.

3.1.6 Building Downwash

The site layout attached in Attachment C shows the location of main storage tank structures, buildings, other major structures (i.e. cooling tower structure), and the stacks for all identified emission sources. Process vessels, pipe racks, and other open, elevated process equipment support structures are not modelled for downwash effects. Stack heights will be specified to comply with good engineering practice (GEP) requirements established in 326 IAC 1-7-4, and guidance given in IDEM's Air Quality Modeling Policies, November 2014.

Building downwash affects will be analyzed using EPA's Building Downwash Input Program with Plume Rise Model Enhancements (BPIP-PRIME) algorithm. The BPIP-PRIME program provided by BEE-Line Software Co. with its latest BEEST for Windows Suite (BEEST Version 11.09, BPIPPRM 04274) will be used to determine the required wind-direction-specific building dimensions.

A list of buildings, large tanks, and other major structures which will be modeled and assessed for downwash effects is given in Attachment G; modeled input is based on available definition of each structure's physical parameters at the time of permit application drafting.

The Riverview facility design is based primarily on a series of processes housed in towers without significant associated buildings or structures. As shown in Attachment E, many of the exhaust heights are in excess of 100 feet above grade level (agl). The coal pile domes are of geodesic shape with round shape at the top, but for purposes of modeling they are assumed as cylindrical structures for their full height. Therefore, any downwash impacts seen in the modeling results from these domes are conservative, as rounded shape will not have the same impact as that of square edged type structure. Of note, none of the stack heights exceed the GEP maximum stack height of 65 m. The sources will be modeled at the proposed heights shown in Attachment E.

3.1.7 Meteorological Data

The meteorological data used in AERMOD dispersion analysis is the most recent data set of pre-processed files available from IDEM. IDEM considers data from the Evansville Regional Airport NWS meteorological monitoring station to be representative for sites in southwest Indiana, including Spencer County.

The complete meteorological data set, covering 5 years from 2012-2016 of continuous monitoring data from the Evansville Regional Airport meteorological station, comprises 10 files; 5 files of surface scalar parameter data (.SFC file-type), one for each year, and 5 files of profile elevation data (.PFL file-type), one for each year. The meteorological data combines data from Evansville Regional Airport NWS and Lincoln, Illinois upper air measuring station. The data was processed by IDEM in the latest AERMET (16216) and have adjusted surface friction velocity (U*).

IDEM provided the meteorological data in these pre-processed file types for direct input to AERMOD requiring no additional processing by applicants, and this will be utilized by Riverview Energy as part of its permit application.

The wind rose of the five years of data is shown in Attachment G.

3.2 Modeling Analysis

The air quality impact assessment component of the permit application modeling comprises two distinct phases. First, a preliminary analysis is conducted and modeled results for ground-level concentrations of modeled criteria pollutants are compared to applicable significant impact levels (SILs) per US EPA and IDEM; based on the outcome of the preliminary analysis, a more comprehensive impact analysis will be conducted through modeling as part of the permit application process.

The preliminary impact analysis predicts by air dispersion modeling the maximum impact of significant emissions increases from the proposed facility for comparison with the SILs of each criteria pollutant. If the modeled ground level concentrations resulting from emissions from the proposed facility are predicted to be less than the SILs, no further modeling for comprehensive impact analysis is required by IDEM.

For modeled ground level concentrations that exceed the SILs, additional modeling for full impact analysis is required. In this case, the preliminary analysis is used to define the significant impact area (SIA) within which the full impact analysis must be performed. The modeling analysis will include the potential emissions from the Riverview Project, all other sources inside the significant impact area (SIA), and other distant sources taken from the NAAQS inventory that may impact the SIA. IDEM will be consulted on distant sources to be included in any comprehensive analysis conducted with SIA or within 50 kilometers of the site. See section 3.2.3 for details.

3.2.1 Source Inventories

Based on the total potential to emit for the following pollutants exceeding significant emission rates per IDEM, Riverview Energy will perform air dispersion modeling for the pollutants and averaging periods identified below for the emissions sources as presented in Attachment E.

PM2.5 – 24-hr, Annual

PM10 – 24-hr

SO2 – 1-hr, 3-hr, 24-hr, Annual

NO2 – 1-hr, Annual

CO – 1-hr, 8-hr

Predicted ground-level concentrations modeled will be compared to SIL levels for each pollutant and applicable averaging period, as presented in table 3-2.

Table 3-2

Pollutant	Averaging Period	Significant Impact Level (SIL) (µg/m3)
$PM_{2.5}$	Annual 24-hr	0.3 1.2
PM_{10}	24-hr	5
SO_2	Annual 24-hr 3-hr 1-hr	1 5 25 7.8
NO_2	Annual 1-hr	1 7.5
CO	8-hr 1-hr	500 2000

Emission rates and physical source parameters used to define each modeled case are presented in Attachment E.

3.2.2 Background Values

For SIL analysis modeling, background concentrations are not required to be included in the model. Appropriate background values will be added to modeled concentrations when a NAAQS analysis is being conducted. PSD increment modeling results will be compared with 80% of the available PSD Class II increment.

Where necessary, for modeling associated with Riverview Energy's permit application, the background concentrations based on monitoring data from the most current three-year period (2015-2017) from the closest monitoring station will be used for all pollutants. This is in lieu of site-specific monitoring requirements.

The existing ambient background data was obtained from IDEM through the IDEM web interface that includes Indiana-specific background concentrations. The closest monitoring station location to the Riverview Energy site in Spencer Co., IN, for most of the pollutants is Evansville, IN. The background concentrations and the source monitoring stations selected for modeling purposes for this project are indicated in table 3-3 below.

Table 3-3

Pollutant	Averaging Period	Annual Three Year (2015-2017) Design Value		Monitoring Site ID, and Location - County, City and Site Name
		(ppm)	(µg/m3)	
$PM_{2.5}$	Annual 24-hr	- -	8.7 19	181470009, SPENCER, DALE, DALE-ELEMENTARY SCHOOL
PM_{10}	24-hr	-	31	18-037-2001, DUBOIS, JASPER, JASPER-POST OFFICE
SO_2	Annual 24-hr 3-hr 1-hr	0.00138 0.00423 0.00863 13 ppb	3.6 11.1 22.6 33.0	18-163-0021, VANDERBURGH, EVANSVILLE, EVANSVILLE-BUENA VISTA
NO_2	Annual	0.008	15	18-163-0021, VANDERBURGH, EVANSVILLE-BUENA VISTA, EVANSVILLE
NO_2	1-hr	36 ppb	67.68	18-141-0015, St. Joseph, SOUTH BEND-SHIELDS DR, SOUTH BEND (See Note)
CO	8-hr 1-hr	1.8 3.0	1259.5 1908.3	18-163-0022, VANDERBURGH, EVANSVILLE, EVANSVILLE-LLOYD

Note: The 1-hour NO2 monitoring data from Evansville, IN, monitoring station is incomplete, and therefore, IDEM recommends the use of 1-hr monitoring data from the South Bend monitoring station as background concentration.

3.2.3 Modeling of Existing Sources

Comprehensive impact analysis may be required if the preliminary analysis indicate exceedance of SIL(s). Based on guidance from U.S. EPA (U.S. EPA

Memo from Tyler Fox dated March 01, 2011) concerning the 1-hour standards for SO2 and NO2, a 10 kilometers distance is considered adequate to determine which nearby sources to include in the modeling. Large emitting sources like utilities that are outside the 10 kilometers boundary and out to 50 kilometers, will also be considered as they could have a significant impact on the project's SIA.

The existing sources located in Indiana and Kentucky that could impact the project's SIA and that will be included in a NAAQS modeling are presented Attachment I.

The modeled results will be compared to the PSD Class II increments as well as the ambient air quality standards as indicated in the table 3-4 below.

Table 3-4

Pollutant	Averaging Period	Concentration Used for Comparison to Standard	NAAQS Standard (µg/m3)	PSD Class II Increment (µg/m3)
$PM_{2.5}$	Annual	Highest average of the annual averages across 5 years	12	4
	24-hr	Multiyear average of 8th highest (98th percentile) across 5 years	35	-
	24-hr	Highest Second High	-	9
PM_{10}	Annual	Highest	Revoked	17
	24-hr	Highest Sixth High over 5 years	150	30
SO_2	Annual	Highest	80	20
	24-hr	Highest Second High	365	91
	3-hr	Highest Second High	1300	512
	1-hr	Multiyear average 4th highest (99 percentile)	196.2 (75 ppb)	-
NO_2	Annual	Highest	100 (53 ppb)	25
	1-hr	Multiyear average 8th highest (98th percentile)	188.6 (100 ppb)	-
CO	8-hr	Highest Second High	10000	-
	1-hr	Highest Second High	40000	-

3.2.4 Modeling of Hazardous Air Pollutants (HAPs)

The Riverview Project is expected to be major source of HAPs with PTE HAPs emissions equal to or exceed 10 tons/year for any single HAP or equal to or exceed 25 tons/year for all HAPs combined. AERMOD will be used to estimate the maximum off-site concentration of each applicable HAP emitted. These concentrations along with toxicological data will be part of the inhalation risk and hazard evaluation as provided by U.S. EPA. Toxicological dose response information that will be used is available at IDEM's web address.

The toxic screening assessment will be performed assuming an acute (short term) and chronic (long term) exposure duration. An acute evaluation will assume exposure duration of 1 to 14 days. A 24-hour modeled concentration will be used in the evaluation of acute risk. A chronic evaluation will assume exposure duration of 24 hours a day, 365 days per year, for 70 years. An annual average modeled concentration will be used in the evaluation of chronic exposure.

The screening analysis will be conducted for non-cancer (acute and chronic) risk evaluation for all applicable HAPs, and cancer risk screenings for carcinogenic HAPs.

The sources of HAPs emissions to be modeled are indicated in Attachment E.

3.2.5 Additional Impact Assessments

As part of a PSD application, an additional impacts assessment is required to afford comparative analysis of indirect portions of the project on the local environment. The analysis assesses the impacts of air, ground, and water pollution on soils, vegetation, and visibility caused by any increase in emissions of any regulated pollutant from the source, and from associated growth.

The elements of growth analysis will include the description of growth and effects to infrastructure due to the need for increased labor force in support of the project; an estimation of air emissions from the associated industrial, commercial, and residential growth; and, a determination whether or not the growth will cause an increase in air emissions that could adversely affect the air quality.

The soils and vegetation analysis will include an assessment of the project impacts to local flora and fauna to the extent known. This will include a comparison of project impacts to known levels that are generally protective of vegetation and agriculture as well as a listing of threatened or endangered species in the project area and any potential project impact to them.

The visibility impairment analysis will be included to assess the potential effect of project emissions on local visibility, and on near and long-range Class I areas. The assessment is completed by modeling project emissions in the EPA VISCREEN model and comparing the impacts to certain thresholds. The VISCREEN analysis will be completed based on local background visual range values.

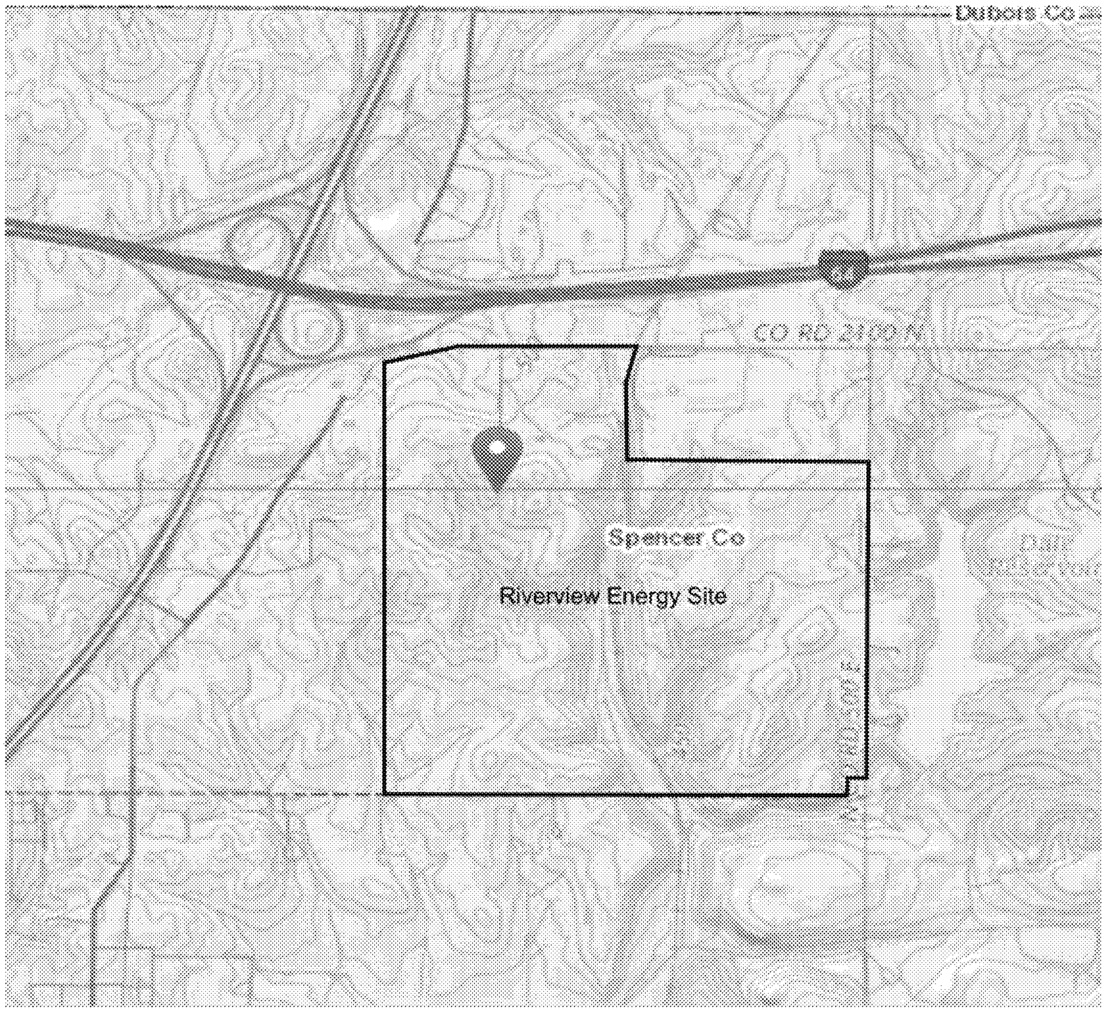
The nearest Class I area is Mammoth Cave, Kentucky, located approximately 120 km from the proposed Riverview Energy project location. It is expected that given the distance and the relatively low emissions from the project, Class I area impacts are not expected to occur. Should a pollutant potentially exceed the applicable SIL and should a Class I area PSD Increment be applicable for that pollutant and averaging period, then receptors located in the direction of the Class I area and at a distance of 50 km from the Riverview source will be modeled and those values compared with the applicable Class I PSD Increment level. The Federal Land Managers' Air Quality Related Values Work Group (FLAG) Phase 1 Report-Revised (2010) for Class I Areas will also be reviewed as part of visibility assessments for areas within 50 km and at distances greater than 50 km.

As requested by the National Park Service, visibility impacts at the Lincoln Boyhood National Memorial (LIBO), Lincoln City, Indiana, will also be assessed. The Lincoln Boyhood National Memorial is located approximately 8 km to the south of the proposed Riverview Energy project location.

The additional impacts assessment will be documented and provided to the IDEM for review. All electronic modeling input and output files generated and used to support the Riverview project will be provided to IDEM for review.

Attachment A – Facility Location and Boundary, Spencer Co., IN

Attachment B – Area Topographic Map



Attachment C – Block Flow Diagrams

DRAWING NUMBERS	TITLE
H102-0000-EV-DWG-EV2-0001	Drawing Index
H102-0000-EV-DWG-EV2-0002	Site Overall Conceptual BFD for Air Permits
H102-1000-EV-DWG-EV2-0001	Block 1000 Coal Handling BFD
H102-1500-EV-DWG-EV2-0001	Block 1500 Additives Handling BFD
H102-2000-EV-DWG-EV2-0001	Block 2000 VCC Unit BFD
H102-2000-EV-DWG-EV2-0002	Block 2000 VCC Detail BFD
H102-3000-EV-DWG-EV2-0001	Block 3000 Sulfur Recovery BFD
H102-3000-EV-DWG-EV2-0003	Block 3000 Amine Recovery Unit Detail BFD
H102-3000-EV-DWG-EV2-0004	Block 3000 Amine Storage Detail BFD
H102-4000-EV-DWG-EV2-0001	Block 4000 Offsites Unit BFD
H102-5000-EV-DWG-EV2-0001	Block 5000 Residue Solidification Unit BFD
H102-6000-EV-DWG-EV2-0001	Block 6000 Utilities BFD
H102-6500-EV-DWG-EV2-0001	Block 6500 Water Supply & Treatment BFD
H102-7000-EV-DWG-EV2-0001	Block 7000 Hydrogen Production BFD
H102-8000-EV-DWG-EV2-0001	Block 8000 Waste Water Treatment BFD
H102-8000-EV-DWG-EV2-0002	Block 8000 – VCC Waste Water Management

NOTES:

LEGEND:

XX00 = PROCESS BLOCK OR PLANT AREA NUMBER

ISSUE	REV	DATE	REVISION DESCRIPTION	BY	CHK	APP	CLIENT
IFP	3	9OCT18	APPLICATION REVISIONS TO DATE	RN	SAL	BP	
IFP	2	15MAY18	APPLICATION REVISIONS TO DATE	RN	SAL	BP	
IFP	1	18JAN18	ISSUE FOR PERMIT	RN	SAL	BP	
IFI	0	28NOV17	ISSUE FOR INFORMATION	RN	SAL		

RIVERVIEW ENERGY CORPORATION

KBR

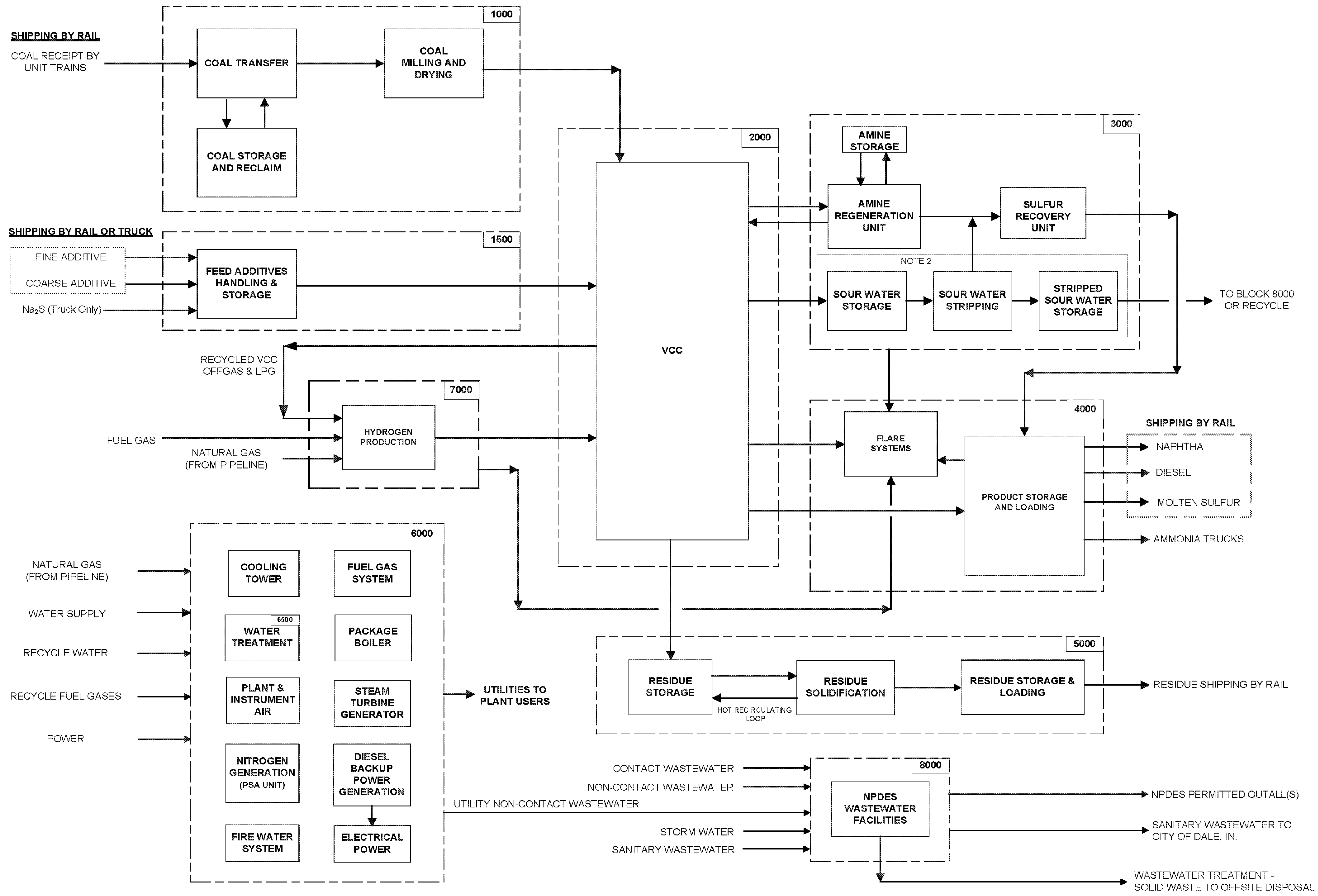
BLOCK FLOW DIAGRAM FOR PERMITTING BASIS

DRAWING INDEX

DIRECT COAL HYDROGENATION (DCH) PLANT
DALE, INDIANA

CLASS	JOB NO.	DOCUMENT NO.	SHEET	REV
	CLIENT	CLIENT RIVERVIEW ENERGY CORPORATION		
	KBR H102	KBR H102-0000-EV-DWG-EV2-0001		

DIRECT COAL HYDROGENATION FACILITY - OVERALL PROCESS BLOCK FLOW DIAGRAM FOR AIR PERMITTING



NOTES:

1. SEE INDIVIDUAL AREA BLOCK FLOW DIAGRAMS FOR PROJECT DEFINITION OF EMISSION UNITS AND PRIMARY EMISSION POINTS FROM OPERATING FACILITIES.

2. PHENOLIC AND NON-PHENOLIC SOUR WATER SYSTEMS HAVE PARALLEL EQUIPMENT

LEGEND:

XX00 = PROCESS BLOCK OR PLANT AREA NUMBER

ISSUE	REV	DATE	REVISION DESCRIPTION	BY	CHK	APP	CLIENT
IFP	3	9OCT18	APPLICATION REVISIONS TO DATE	RN	SAL	BP	
IFP	2	15MAY18	APPLICATION REVISIONS TO DATE	RN	SAL	BP	
IFP	1	18JAN18	ISSUE FOR PERMIT	RN	SAL	BP	
IFI	0	28NOV17	ISSUE FOR INFORMATION	RN	SAL		

RIVERVIEW ENERGY CORPORATION

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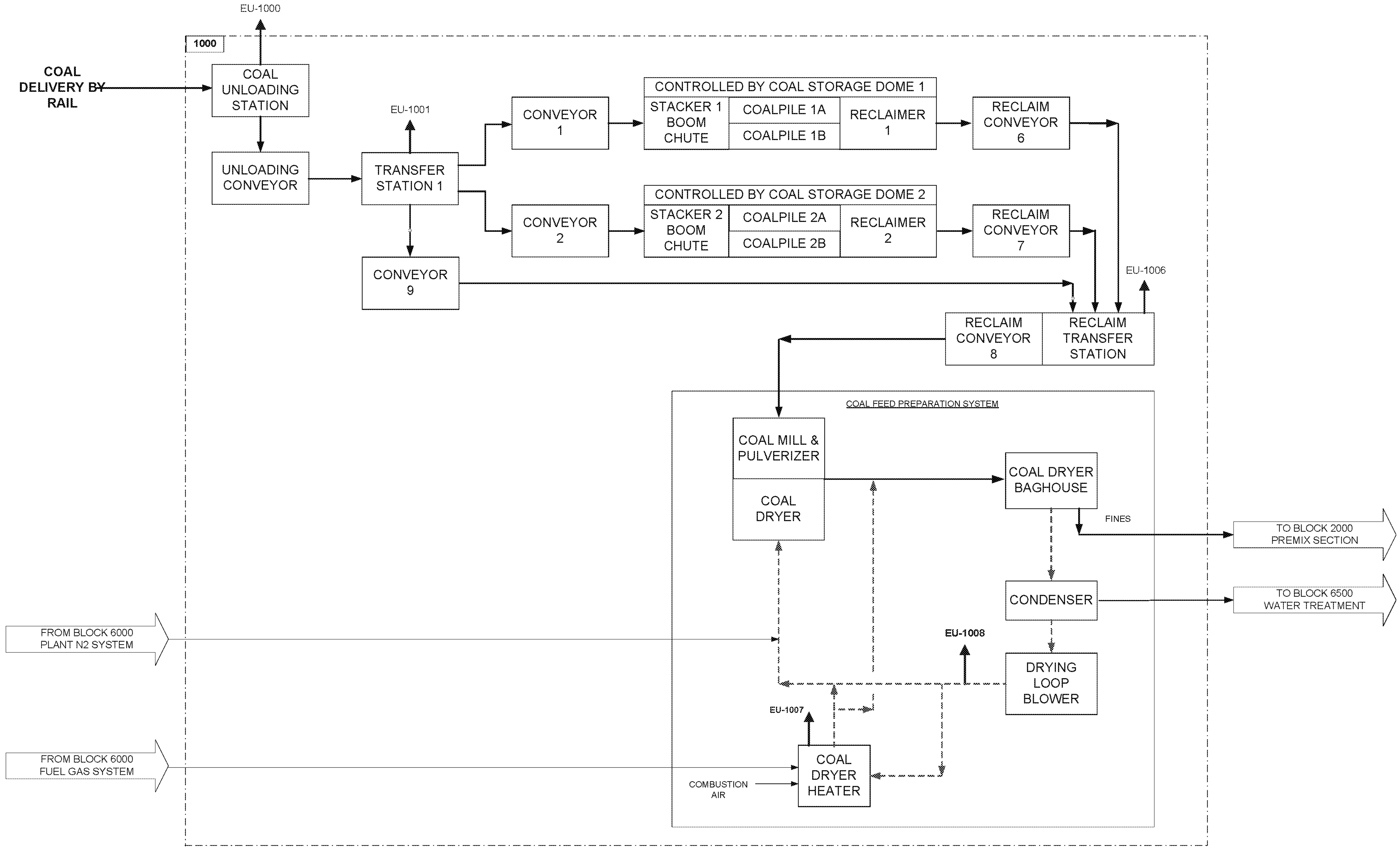
BLOCK FLOW DIAGRAM FOR PERMITTING BASIS
OVERALL PROCESS FACILITY
DIRECT COAL HYDROGENATION (DCH) PLANT
DALE, INDIANA

CLASS	JOB NO.	DOCUMENT NO.	SHEET	REV
	CLIENT	CLIENT: RIVERVIEW ENERGY CORPORATION		
	KBR: H102	KBR: H102-0000-EV-DWG-EV2-0002	1 OF 1	

BLOCK 1000

COAL HANDLING



NOTES:

EU-1000	Coal Unloading Station
EU-1001	Transfer Station 1
~~EU-1002~~	~~Stacker 1 Boom Chute~~
~~EU-1003~~	~~Coal Pile 1A/1B~~
~~EU-1004~~	~~Stacker 2 Boom Chute~~
~~EU-1005~~	~~Coal Pile 2A/2B~~
EU-1006	Reclaim Transfer Station
EU-1007	Coal Dryer Heater
EU-1008	Coal Drying Loop Purge

LEGEND:

XX00 = PROCESS BLOCK OR PLANT AREA NUMBER

ISSUE	REV	DATE	REVISION DESCRIPTION	BY	CHK	APP	CLIENT
IFP	3	9OCT18	APPLICATION REVISIONS TO DATE	RN	SAL	BP	
IFP	2	15MAY18	APPLICATION REVISIONS TO DATE	RN	SAL	BP	
IFP	1	18JAN18	ISSUE FOR PERMIT	RN	SAL	BP	
IFI	0	28NOV17	ISSUE FOR INFORMATION	RN	SAL		

RIVERVIEW ENERGY CORPORATION

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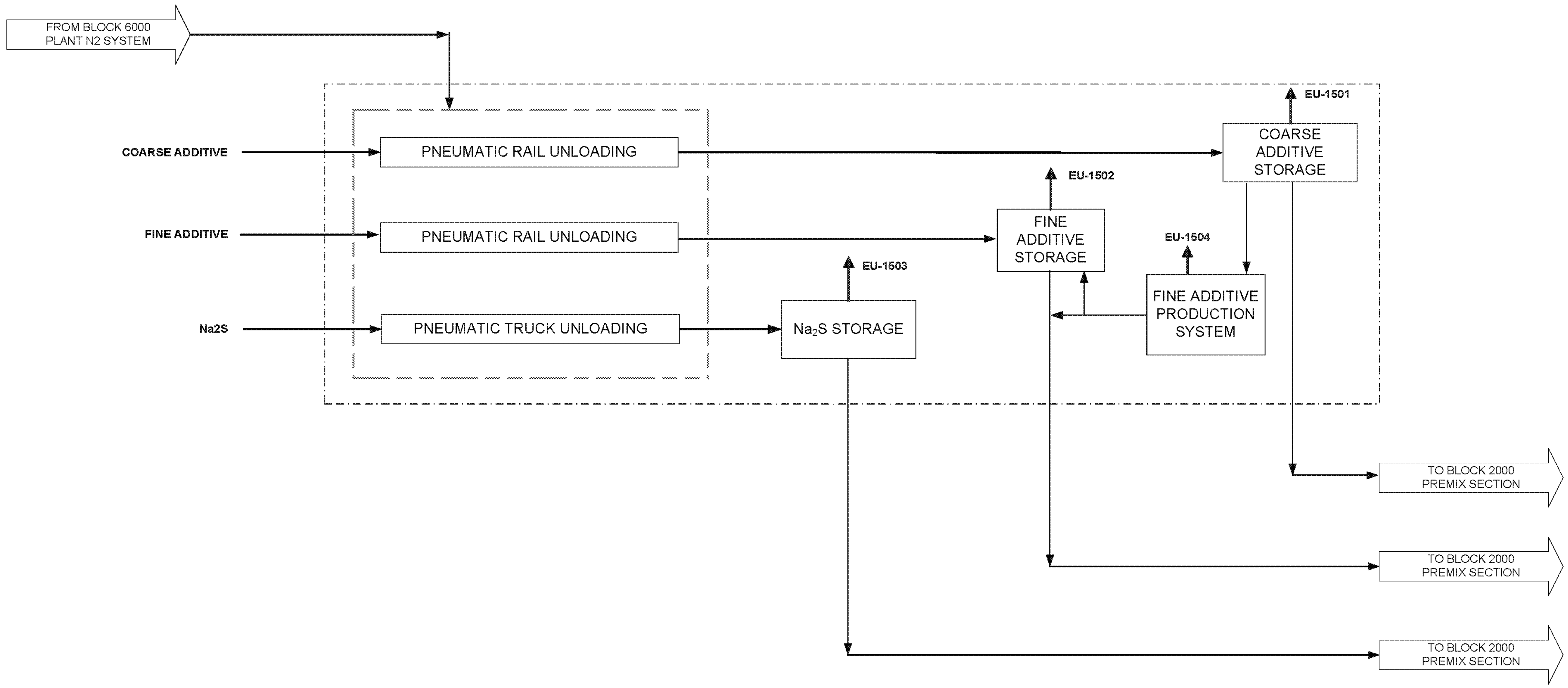
BLOCK FLOW DIAGRAM FOR PERMITTING BASIS
BLOCK 1000 – COAL HANDLING
DIRECT COAL HYDROGENATION (DCH) PLANT
DALE, INDIANA

CLASS	JOB NO.	DOCUMENT NO.	SHEET	REV
	CLIENT	CLIENT RIVERVIEW ENERGY CORPORATION		
	KBR H102	KBR H102-1000-EV-DWG-EV2-0001		

BLOCK 1500

ADDITIVES HANDLING



NOTES:

EU-1501	Coarse Additive Storage Filter
EU-1502	Fine Additive Storage Filter
EU-1503	NA2S Additive Storage Filter
EU-1504	Fine Additive Production System

LEGEND:

XX00 = PROCESS BLOCK OR PLANT AREA NUMBER

ISSUE	REV	DATE	REVISION DESCRIPTION	BY	CHK	APP	CLIENT
IFP	3	9OCT18	APPLICATION REVISIONS TO DATE	RN	SAL	BP	
IFP	2	15MAY18	APPLICATION REVISIONS TO DATE	RN	SAL	BP	
IFP	1	18JAN18	ISSUE FOR PERMIT	RN	SAL	BP	
IFI	0	28NOV17	ISSUE FOR INFORMATION	RN	SAL		

RIVERVIEW ENERGY CORPORATION

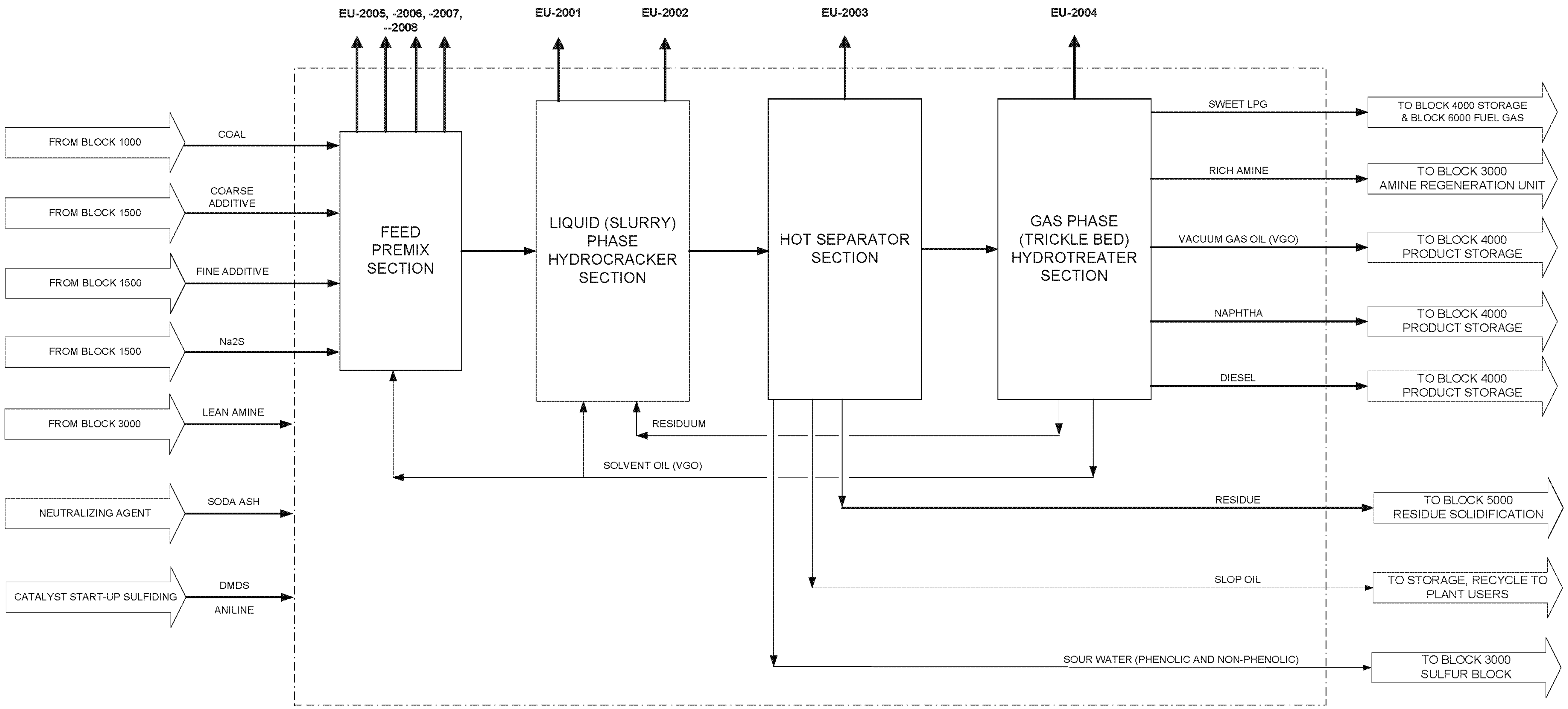
KBR

BLOCK FLOW DIAGRAM FOR PERMITTING BASIS
BLOCK 1500 ADDITIVES HANDLING
DIRECT COAL HYDROGENATION (DCH) PLANT
DALE, INDIANA

CLASS	JOB NO.	DOCUMENT NO.	SHEET	REV
	CLIENT	RIVERVIEW ENERGY CORPORATION		
	H102	H102-1000-EV-DWG-EV2-0001		

BLOCK 2000

VEBA COMBI CRACKER (VCC)



NOTES:

1. RESERVED

EU-2001	Feed Heater
EU-2002	Treat Gas Heater
EU-2003	Vac Column Feed Heater
EU-2004	Fractionator Feed Heater
EU-2005	Coal Handling System Filter
EU-2006	Coarse Additive Handling System Filter
EU-2007	Fine Additive Handling System Filter
EU-2008	Na2S Handling System Filter

LEGEND:

XX00 = PROCESS BLOCK OR PLANT AREA NUMBER

ISSUE	REV	DATE	REVISION DESCRIPTION	BY	CHK	APP	CLIENT
IFP	3	9OCT18	APPLICATION REVISIONS TO DATE	RN	SAL	BP	
IFP	2	15MAY18	APPLICATION REVISIONS TO DATE	RN	SAL	BP	
IFP	1	18JAN18	ISSUE FOR PERMIT	RN	SAL	BP	
IFI	0	[illegible]	ISSUE FOR INFORMATION	RN	SAL		

RIVERVIEW ENERGY CORPORATION

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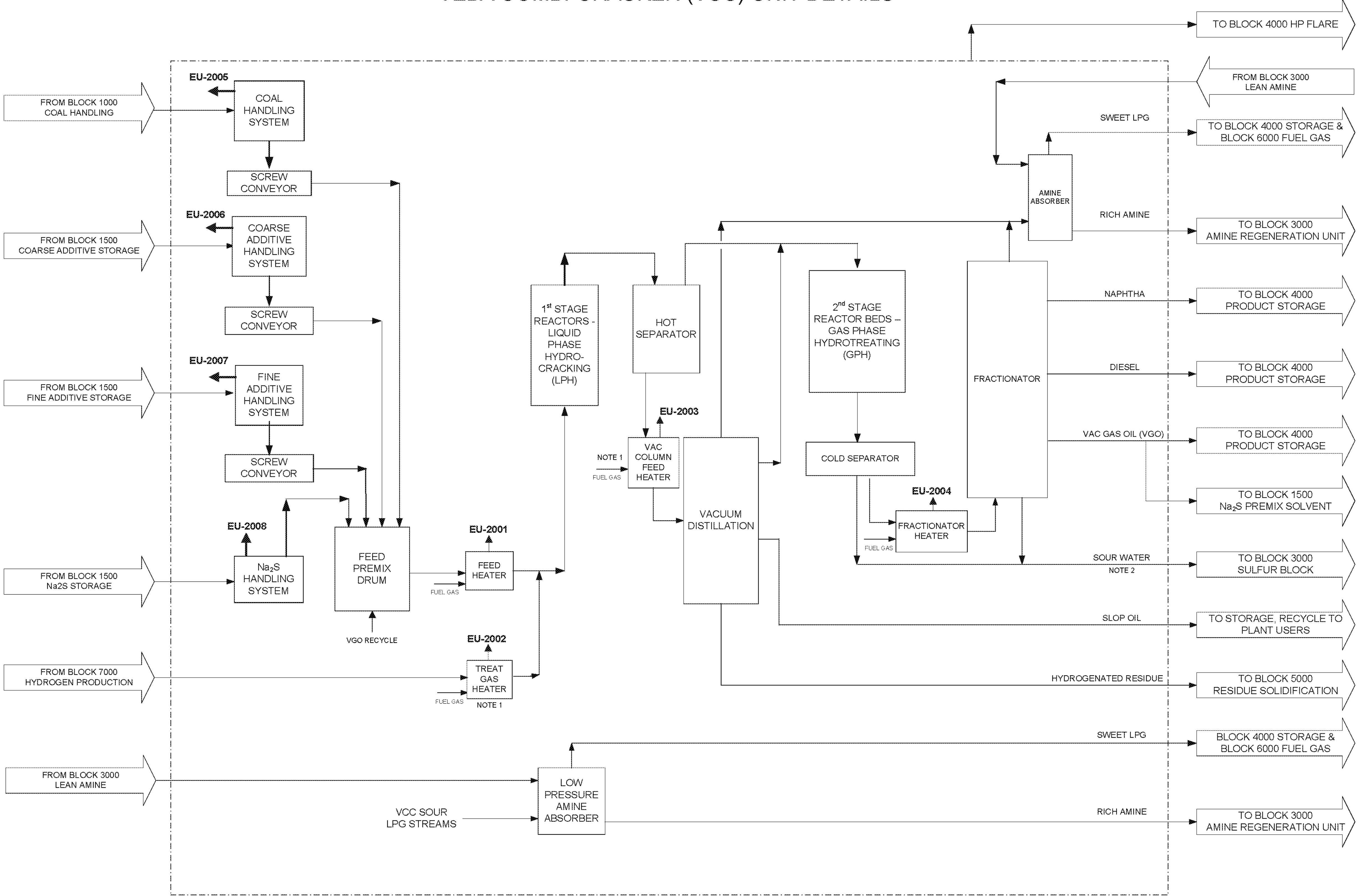
BLOCK FLOW DIAGRAM FOR PERMITTING BASIS
BLOCK 2000 – VCC UNIT
DIRECT COAL HYDROGENATION (DCH) PLANT
DALE, INDIANA

CLASS	JOB NO.	DOCUMENT NO.	SHEET	REV
	H102	H102-2000-EV-DWG-EV2-0001		

CLIENT: RIVERVIEW ENERGY CORPORATION

BLOCK 2000

VEBA COMBI-CRACKER (VCC) UNIT DETAILS



NOTES:

1. HEATER TO INCLUDE PROVISIONS FOR AIR PREHEAT.
2. PHENOLIC SOUR WATER FROM VCC VAC COLUMN.

EU-2001	Feed Heater
EU-2002	Treat Gas Heater
EU-2003	Vac Column Feed Heater
EU-2004	Fractionator Feed Heater
EU-2005	Coal Handling System Filter
EU-2006	Coarse Additive Handling System Filter
EU-2007	Fine Additive Handling System Filter
EU-2008	Na2S Handling System Filter

LEGEND:

XX00 = PROCESS BLOCK OR PLANT AREA NUMBER

ISSUE	REV	DATE	REVISION DESCRIPTION	BY	CHK	APP	CLIENT
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IFP	2	15MAY18	APPLICATION REVISIONS TO DATE	RN	SAL	BP	
IFP	1	18JAN18	ISSUE FOR PERMIT	RN	SAL	BP	
IFI	0	28NOV17	ISSUE FOR INFORMATION	RN	SAL		

RIVERVIEW ENERGY CORPORATION

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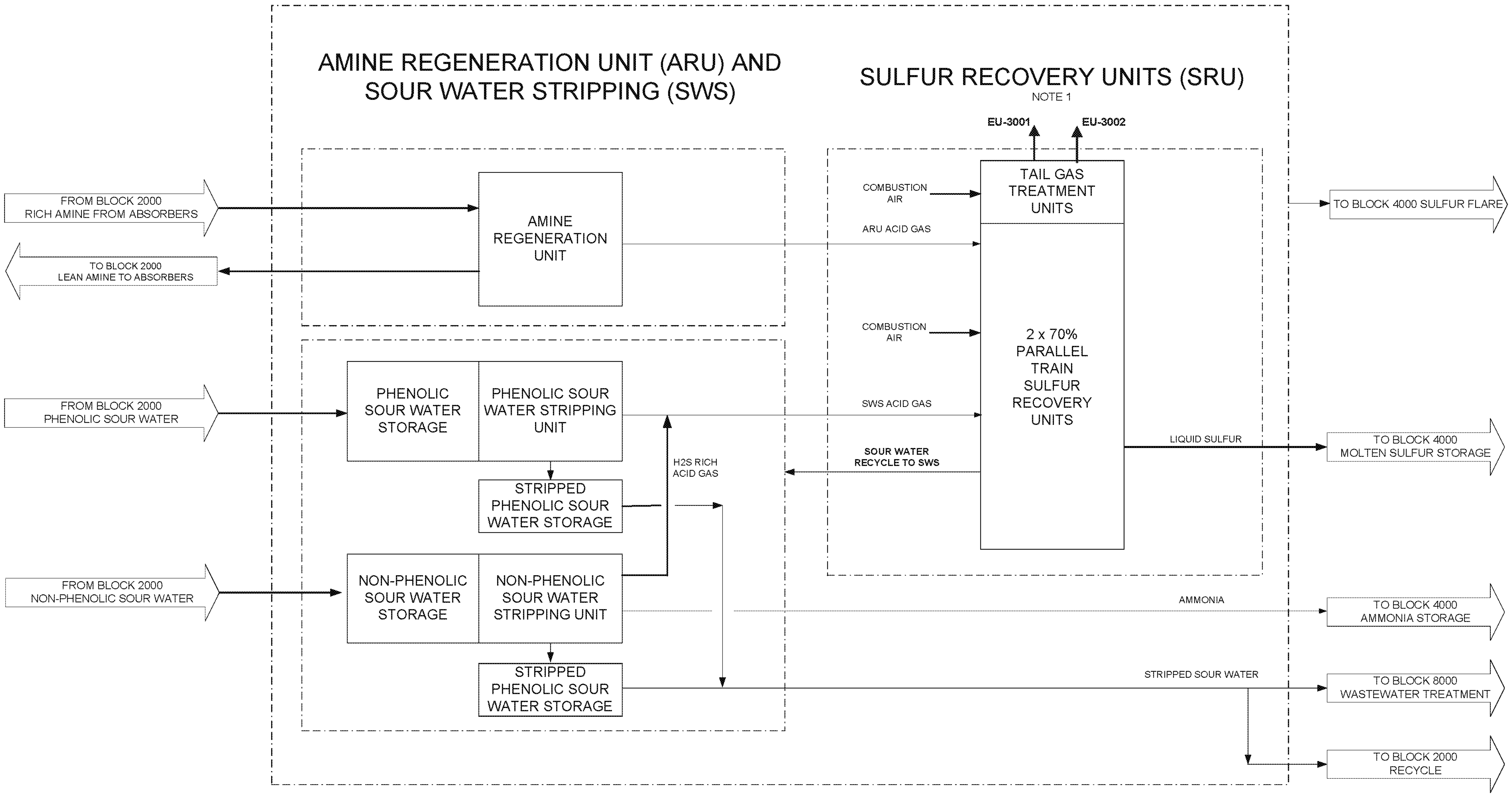
BLOCK FLOW DIAGRAM FOR PERMITTING BASIS
BLOCK 2000 – VCC UNIT DETAIL
DIRECT COAL HYDROGENATION (DCH) PLANT
DALE, INDIANA

CLASS	JOB NO.	DOCUMENT NO.	SHEET	REV
	CLIENT	RIVERVIEW ENERGY CORPORATION		
	H102	H102-2000-EV-DWG-EV2-0002		

BLOCK 3000

SULFUR RECOVERY



NOTES:

1. 2 x 70% CLAUS SRU's WITH TAIL GAS TREATMENT UNITS (TGTU)

EU-3001	TGTU Stack A
EU-3002	TGTU Stack B

LEGEND:

XX00 = PROCESS BLOCK OR PLANT AREA NUMBER

ISSUE	REV	DATE	REVISION DESCRIPTION	BY	CHK	APP	CLIENT
IFP	3	9OCT18	APPLICATION REVISIONS TO DATE	RN	SAL	BP	
IFP	2	15MAY18	APPLICATION REVISIONS TO DATE	RN	SAL	BP	
IFP	1	18JAN18	ISSUE FOR PERMIT	RN	SAL	BP	
IFI	0	28NOV17	ISSUE FOR INFORMATION	RN	SAL		

RIVERVIEW ENERGY CORPORATION

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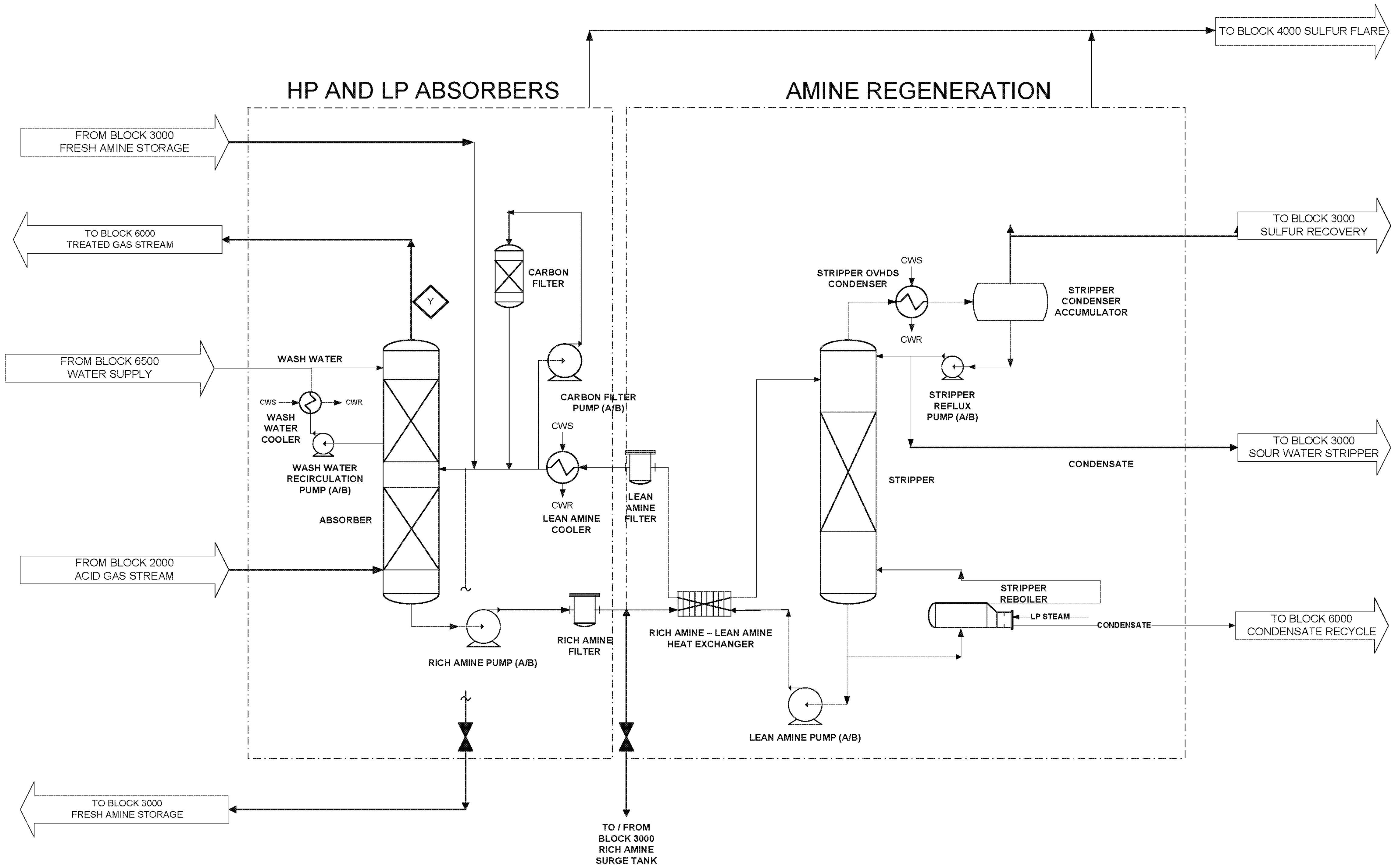
BLOCK FLOW DIAGRAM FOR PERMITTING BASIS
BLOCK 3000 – ARU – SWS - SRU UNITS
DIRECT COAL HYDROGENATION (DCH) PLANT
DALE, INDIANA

CLASS	JOB NO.	DOCUMENT NO.	SHEET	REV
	CLIENT	CLIENT: RIVERVIEW ENERGY CORPORATION		
	KBR: H102	KBR: H102-3000-EV-DWG-EV2-0001	1 OF 1	

BLOCK 3000
AMINE ABSORBERS & AMINE REGENERATION SYSTEM



NOTES:

LEGEND:

XX00 = PROCESS BLOCK OR PLANT AREA NUMBER

ISSUE	REV	DATE	REVISION DESCRIPTION	BY	CHK	APP	CLIENT
IFP	3	9OCT18	APPLICATION REVISIONS TO DATE	RN	SAL	BP	
IFP	2	15MAY18	APPLICATION REVISIONS TO DATE	RN	SAL	BP	
IFP	1	18JAN18	ISSUE FOR PERMIT	RN	SAL	BP	
IFI	0	28NOV17	ISSUE FOR INFORMATION	RN	SAL		

RIVERVIEW ENERGY CORPORATION

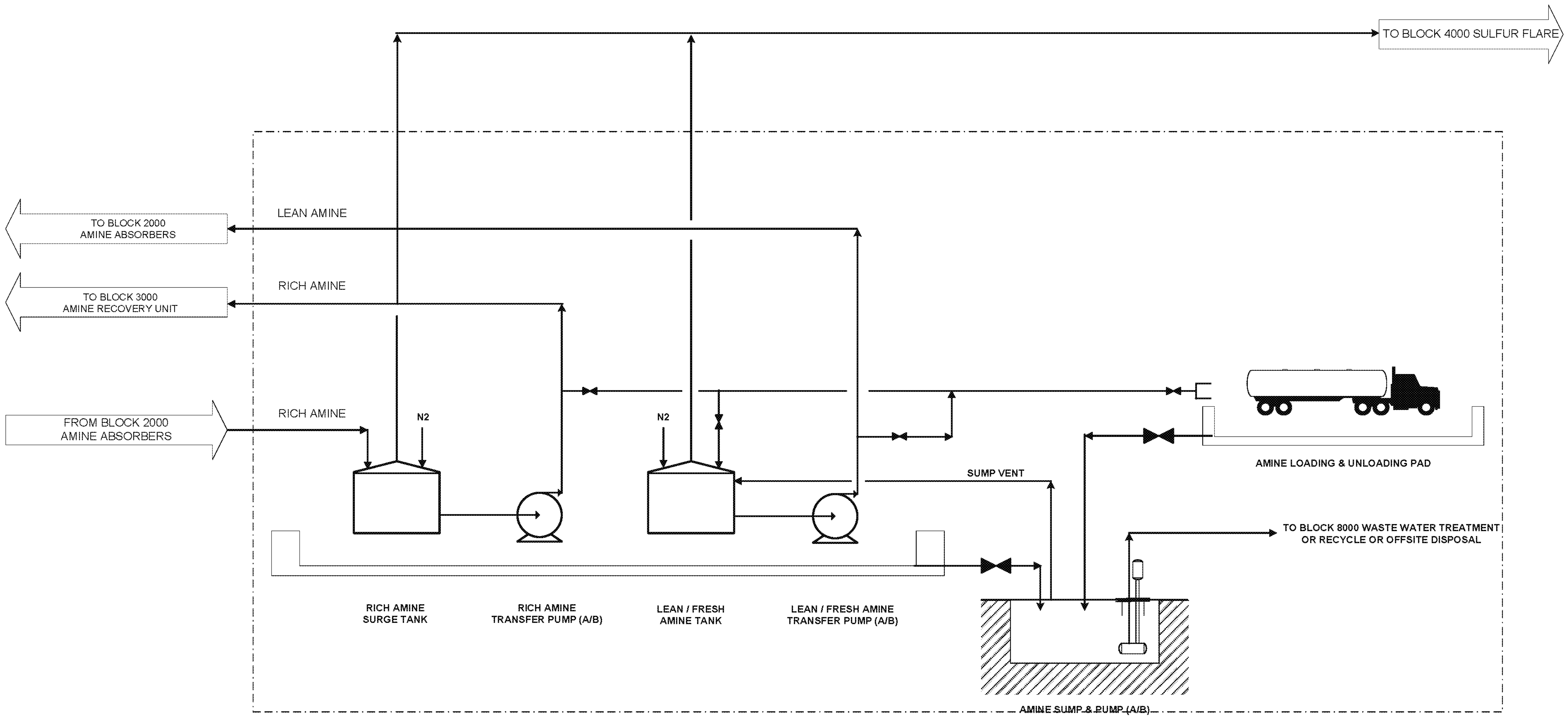
BLOCK FLOW DIAGRAM FOR PERMITTING BASIS

BLOCK 3000 – ARU DETAILS

DIRECT COAL HYDROGENATION (DCH) PLANT
DALE, INDIANA

CLASS	JOB NO.	DOCUMENT NO.	SHEET	REV
	CLIENT	CLIENT RIVERVIEW ENERGY CORPORATION		
	KBR H102	KBR H102-3000-EV-DWG-EV2-0003	1 OF 1	

BLOCK 3000
AMINE SOLVENT STORAGE AND HANDLING SYSTEM



NOTES:

LEGEND:

XX00 = PROCESS BLOCK OR PLANT AREA NUMBER

ISSUE	REV	DATE	REVISION DESCRIPTION	BY	CHK	APP	CLIENT
IFP	3	9OCT18	APPLICATION REVISIONS TO DATE	RN	SAL	BP	
IFP	2	15MAY18	APPLICATION REVISIONS TO DATE	RN	SAL	BP	
IFP	1	18JAN18	ISSUE FOR PERMIT	RN	SAL	BP	
IFI	0	28NOV17	ISSUE FOR INFORMATION	RN	SAL		

RIVERVIEW ENERGY CORPORATION

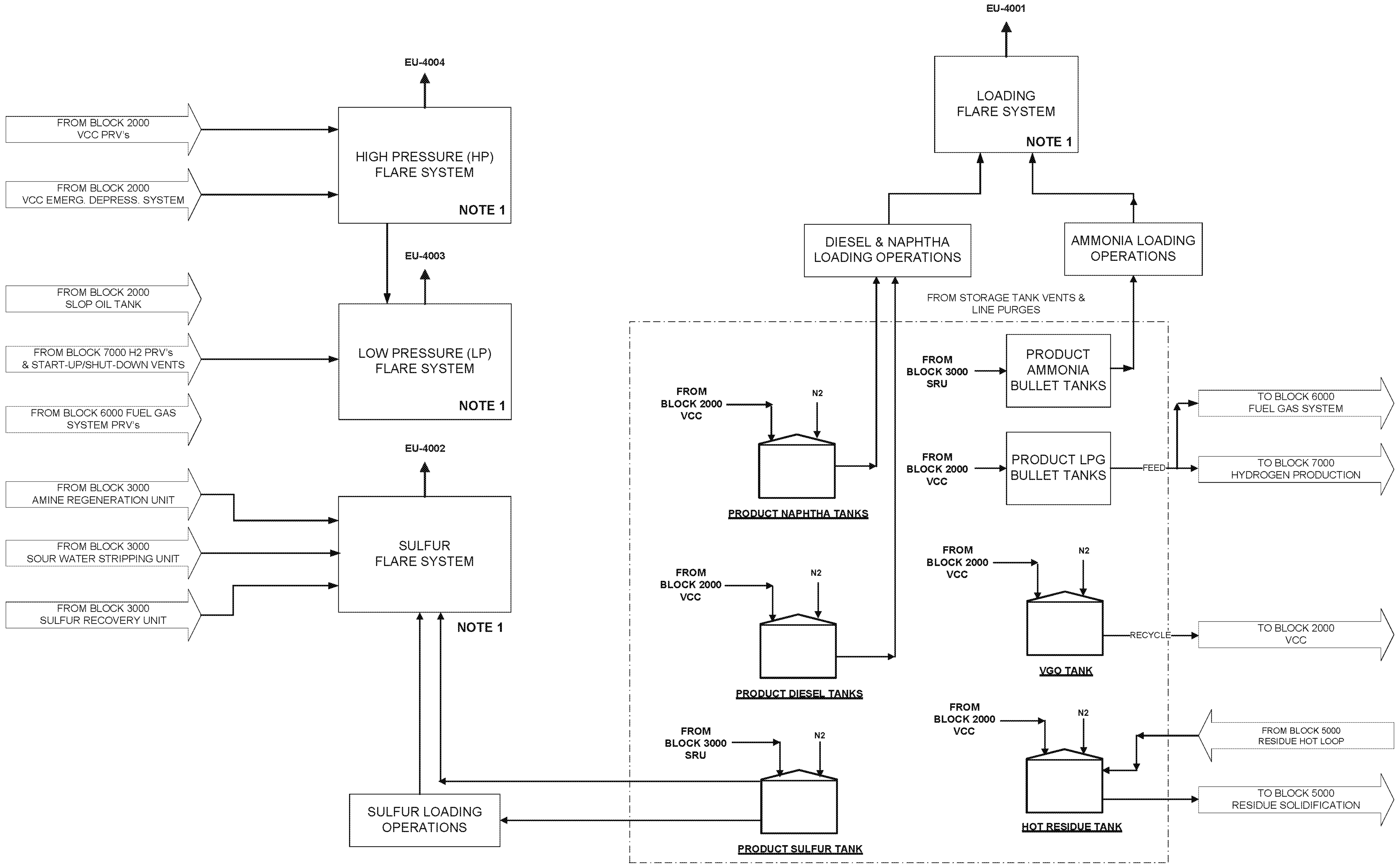
KBR

BLOCK FLOW DIAGRAM FOR PERMITTING BASIS
BLOCK 3000 – ARU STORAGE DETAIL
DIRECT COAL HYDROGENATION (DCH) PLANT
DALE, INDIANA

CLASS	JOB NO.	DOCUMENT NO.	SHEET	REV
	CLIENT	RIVERVIEW ENERGY CORPORATION		
	H102	H102-3000-EV-DWG-EV2-0004	1 OF 1	

BLOCK 4000

OFFSITES



PRODUCT STORAGE
NOTE 2

NOTES:

1. Normal operation of all flares is in STANDBY MODE, i.e., pilots and purges. Flare Systems use Block 6000 supplied Fuel Gas System for supply to pilots and purges, as well as adjustment of Btu/scf heating value as needed at flare tip.

2. Steam is used for heating VGO, Residue, and Sulfur Tanks; Condensate is returned to Block 6500.

EU-4001	Loading Flare
EU-4002	Sulfur Block Flare
EU-4003	LP Flare
EU-4004	HP Flare

3. Sour water tanks vented to Sulfur Block Flare System

LEGEND:

XX00 = PROCESS BLOCK OR PLANT AREA NUMBER

ISSUE	REV	DATE	REVISION DESCRIPTION	BY	CHK	APP	CLIENT
IFP	3	9OCT18	APPLICATION REVISIONS TO DATE	RN	SAL	BP	
IFP	2	15MAY18	APPLICATION REVISIONS TO DATE	RN	SAL	BP	
IFP	1	18JAN18	ISSUE FOR PERMIT	RN	SAL	BP	
IFI	0	28NOV17	ISSUE FOR INFORMATION	RN	SAL		

RIVERVIEW ENERGY CORPORATION

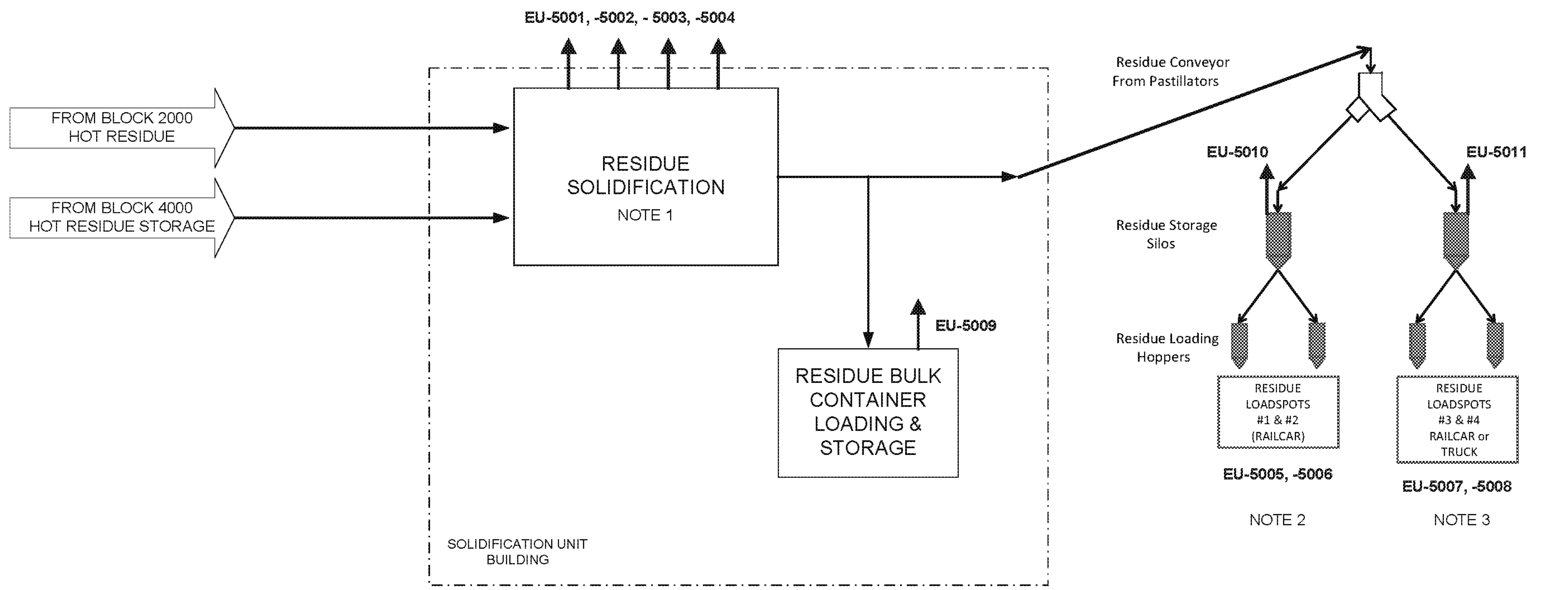
KBR

BLOCK FLOW DIAGRAM FOR PERMITTING BASIS
BLOCK 4000 - OFFSITES
DIRECT COAL HYDROGENATION (DCH) PLANT
DALE, INDIANA

CLASS	JOB NO.	DOCUMENT NO.	SHEET	REV
	CLIENT	CLIENT RIVERVIEW ENERGY CORPORATION		
	KBR H102	KBR H102-4000-EV-DWG-EV2-0001		

BLOCK 5000

RESIDUE SOLIDIFICATION, SHIPPING, & HANDLING



NOTES:

1. FOUR PASTILATOR LINES (A/B/C/D) ARE SERVICED BY ONE STACK. A TOTAL OF 16 PASTILATORS ARE USED TO SOLIDIFY RESIDUE.

2. EU-5005, EU-5006 RAILCAR LOADING AND EU-5010 ARE CONTROLLED BY ONE FABRIC FILTER

3. EU-5007, EU-5008 RAIL/TRUCK LOADING AND EU-5011 ARE CONTROLLED BY ONE FABRIC FILTER

EU-5001A/B/C/D	Residue Pastilators Stack1
EU-5002A/B/C/D	Residue Pastilators Stack2
EU-5003A/B/C/D	Residue Pastilators Stack3
EU-5004A/B/C/D	Residue Pastilators Stack4
EU-5005	Residue Railcar Loading
EU-5006	Residue Railcar Loading
EU-5007	Residue Rail/Truck Loading
EU-5008	Residue Rail/Truck Loading
EU-5009	Residue Bulk Container Loading
EU-5010	Residue Rail Silo Filter
EU-5011	Residue Swing Silo Filter

LEGEND:

XX00 = PROCESS BLOCK OR PLANT AREA NUMBER

ISSUE	REV	DATE	REVISION DESCRIPTION	BY	CHK	APP	CLIENT
IFP	3	9OCT18	APPLICATION REVISIONS TO DATE	RN	SAL	BP	
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IFP	1	18JAN18	ISSUE FOR PERMIT	RN	SAL	BP	
IFI	0	28NOV17	ISSUE FOR INFORMATION	RN	SAL		

RIVERVIEW ENERGY CORPORATION

KBR

BLOCK FLOW DIAGRAM FOR PERMITTING BASIS

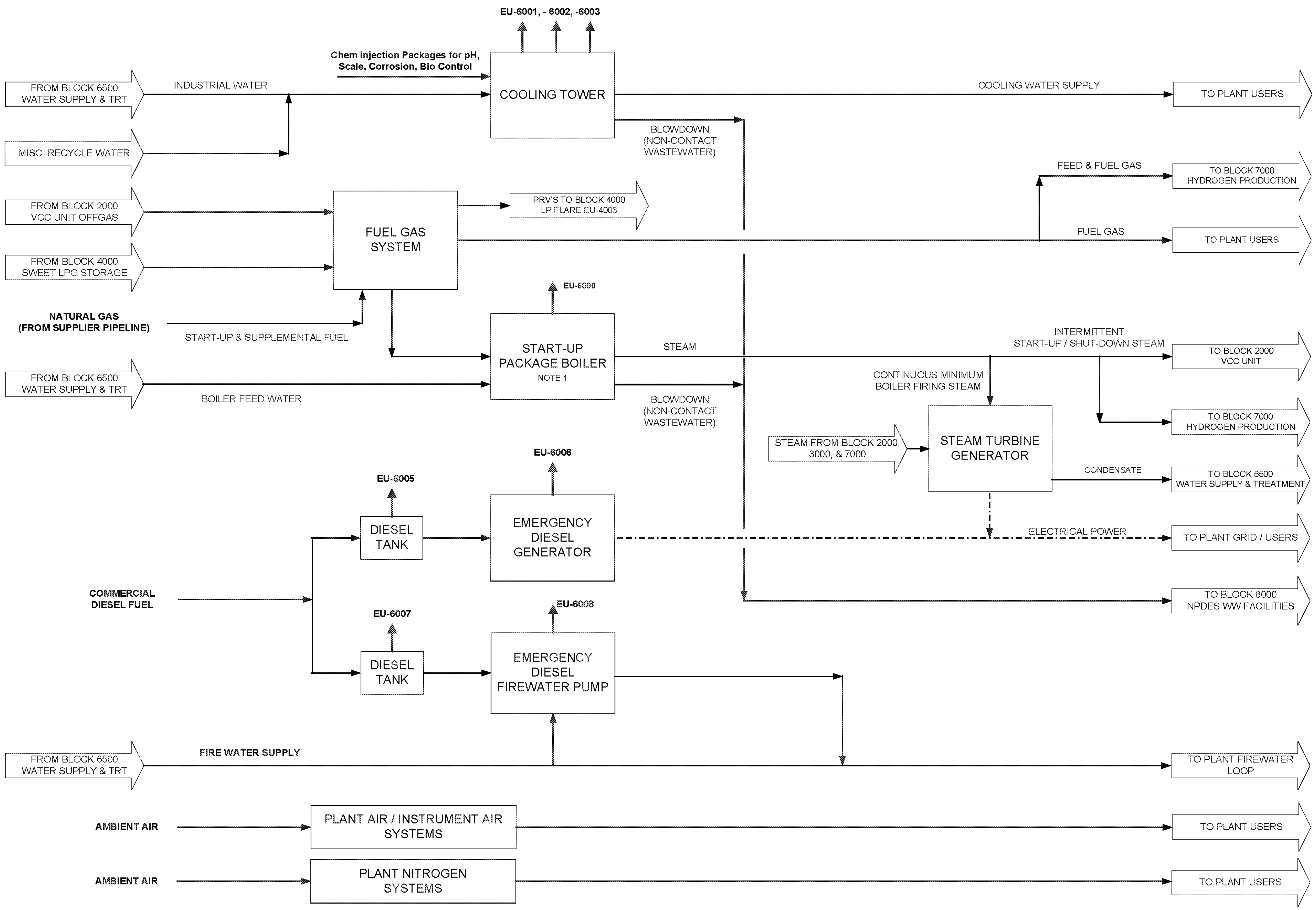
BLOCK 5000 – RESIDUE SOLIDIFICATION & HANDLING

DIRECT COAL HYDROGENATION (DCH) PLANT
DALE, INDIANA

CLASS	JOB NO.	DOCUMENT NO.	SHEET	REV
	CLIENT	CLIENT RIVERVIEW ENERGY CORPORATION		
	KBR H102	KBR H102-5000-EV-DWG-EV2-0001		

BLOCK 6000

UTILITY SYSTEMS



NOTES:

1. PACKAGE BOILER TO PROVIDE STEAM REQUIRED FOR H2 & VCC UNIT START-UPS / SHUT-DOWNS AND SUPPLEMENTAL STEAM TO TURBINE GENERATOR.

EU-6000	Package Boiler
EU-6001	Cooling Tower Cell A
EU-6002	Cooling Tower Cell B
EU-6003	Cooling Tower Cell C
EU-6005	EDG Diesel Tank
EU-6006	Emergency Diesel Generator
EU-6007	EDFWP Diesel Tank
EU-6008	Emergency Diesel FireWater Pump

LEGEND:

XX00 = PROCESS BLOCK OR PLANT AREA NUMBER

ISSUE	REV	DATE	REVISION DESCRIPTION	BY	CHK	APP	CLIENT
IFP	3	9OCT18	APPLICATION REVISIONS TO DATE	RN	SAL	BP	
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IFP	1	18JAN18	ISSUE FOR PERMIT	RN	SAL	BP	
IFI	0	28NOV17	ISSUE FOR INFORMATION	RN	SAL		

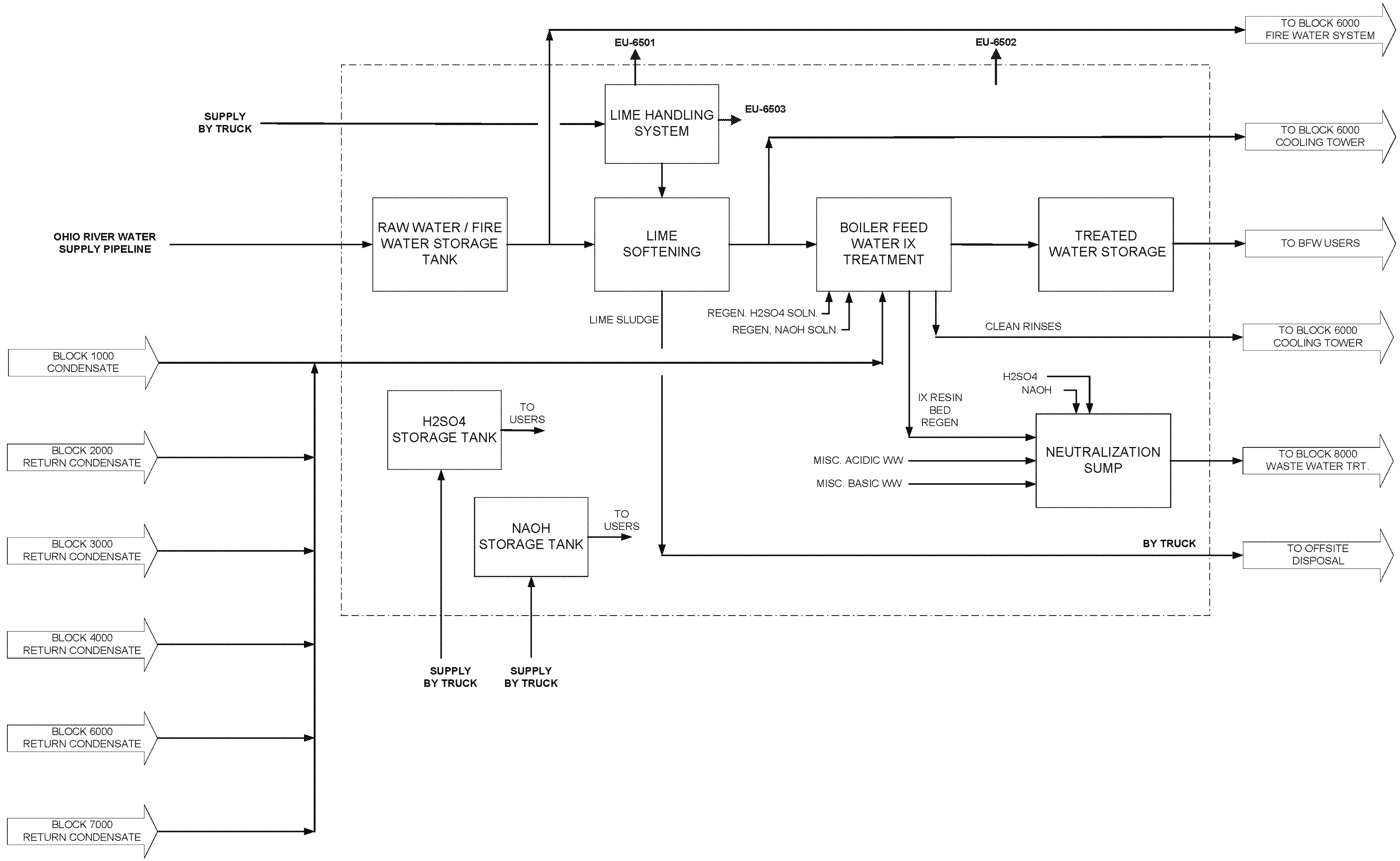
RIVERVIEW ENERGY CORPORATION

BLOCK FLOW DIAGRAM FOR PERMITTING BASIS
BLOCK 6000 - UTILITIES
DIRECT COAL HYDROGENATION (DCH) PLANT
DALE, INDIANA

CLASS	JOB NO.	DOCUMENT NO.	SHEET	REV
	CLIENT	CLIENT RIVERVIEW ENERGY CORPORATION		
	KBR H102	KBR H102-6000-EV-DWG-EV2-0001		

BLOCK 6500

WATER SUPPLY AND TREATMENT



NOTES:

EU-6501	Lime Silo Filter
EU-6502	Deaerator Vent

EU-6503 LIME SLAKER VENT INSIDE WATER TREATMENT BUILDING REV 3 ADDITION

LEGEND:

XX00 = PROCESS BLOCK OR PLANT AREA NUMBER

ISSUE	REV	DATE	REVISION DESCRIPTION	BY	CHK	APP	CLIENT
IFP	3	9OCT18	APPLICATION REVISIONS TO DATE	RN	SAL	BP	
IFP	2	15MAY18	APPLICATION REVISIONS TO DATE	RN	SAL	BP	
IFP	1	18JAN18	ISSUE FOR PERMIT	RN	SAL	BP	
IFI	0	28NOV17	ISSUE FOR INFORMATION	RN	SAL		

RIVERVIEW ENERGY CORPORATION

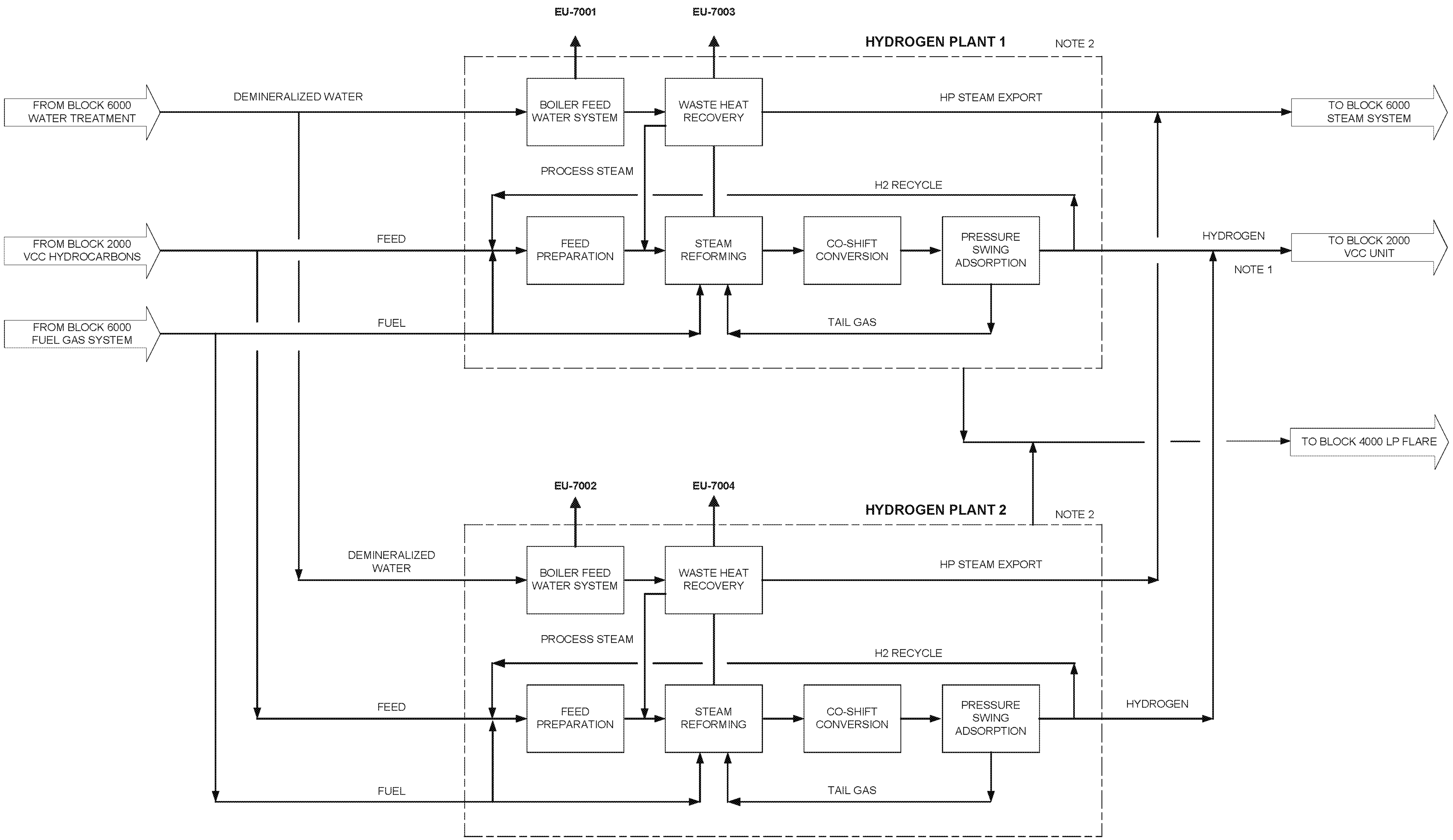
KBR

BLOCK FLOW DIAGRAM FOR PERMITTING BASIS
BLOCK 6500 – WATER SUPPLY & TREATMENT
DIRECT COAL HYDROGENATION (DCH) PLANT
DALE, INDIANA

CLASS	JOB NO.	DOCUMENT NO.	SHEET	REV
	CLIENT	CLIENT RIVERVIEW ENERGY CORPORATION		
	KBR H102	KBR H102-6500-EV-DWG-EV2-0001		

BLOCK 7000

HYDROGEN PRODUCTION



NOTES:

1. 2 TRAINS, TOTAL 506.7 MTPD HYDROGEN PRODUCTION
2. HYDROGEN PRODUCTION LICENSED UNITS OWNED & OPERATED BY SUPPLIER SOLELY FOR RIVERVIEW

EU-7001	Hydrogen Plant 1 Reformer
EU-7002	Hydrogen Plant 2 Reformer
EU-7003	Hydrogen Plant 1 DA Vent
EU-7004	Hydrogen Plant 2 DA Vent

LEGEND:

XX00 = PROCESS BLOCK OR PLANT AREA NUMBER

ISSUE	REV	DATE	REVISION DESCRIPTION	BY	CHK	APP	CLIENT
IFP	3	9OCT18	APPLICATION REVISIONS TO DATE	RN	SAL	BP	
IFP	2	15MAY18	APPLICATION REVISIONS TO DATE	RN	SAL	BP	
IFP	1	18JAN18	ISSUE FOR PERMIT	RN	SAL	BP	
IFI	0	28NOV17	ISSUE FOR INFORMATION	RN	SAL		

RIVERVIEW ENERGY CORPORATION

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BLOCK FLOW DIAGRAM FOR PERMITTING BASIS

BLOCK 7000 - HYDROGEN PRODUCTION

DIRECT COAL HYDROGENATION (DCH) PLANT
DALE, INDIANA

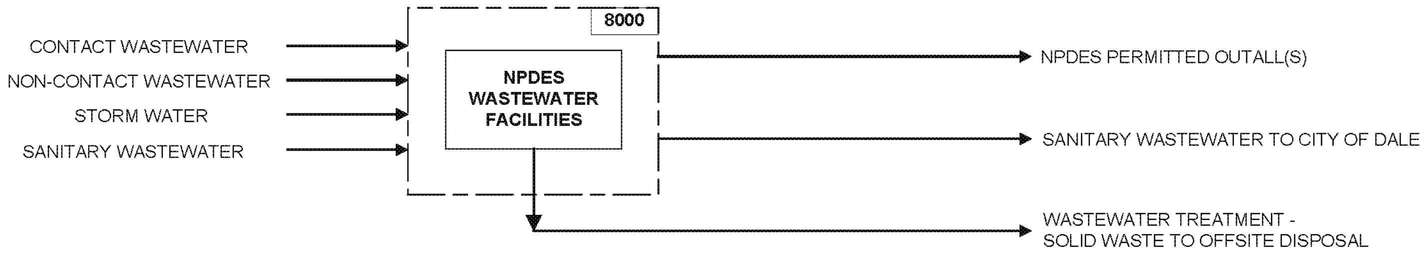
CLASS	JOB NO.	DOCUMENT NO.	SHEET	REV
	CLIENT	CLIENT RIVERVIEW ENERGY CORPORATION		
	KBR H102	KBR H102-7000-EV-DWG-EV2-0001	1 OF 1	

BLOCK 8000

NPDES WASTEWATER FACILITIES

Sanitary Wastewater

There will be sanitary wastewater generation from approximately 100 personnel at the Riverview buildings which include: Gate House, Administration, Maintenance Shops, Warehouse, Control Room / Lab Building. The flow will be collected at lift stations and conveyed to the City of Dale.



NOTES:

LEGEND:

XX00 = PROCESS BLOCK OR PLANT AREA NUMBER

ISSUE	REV	DATE	REVISION DESCRIPTION	BY	CHK	APP	CLIENT
IFP	3	9OCT18	APPLICATION REVISIONS TO DATE	RN	SAL	BP	
IFP	2	15MAY18	APPLICATION REVISIONS TO DATE	RN	SAL	BP	
IFP	1	18JAN18	ISSUE FOR PERMIT	RN	SAL	BP	
IFI	0	28NOV17	ISSUE FOR INFORMATION	RN	SAL		

RIVERVIEW ENERGY CORPORATION

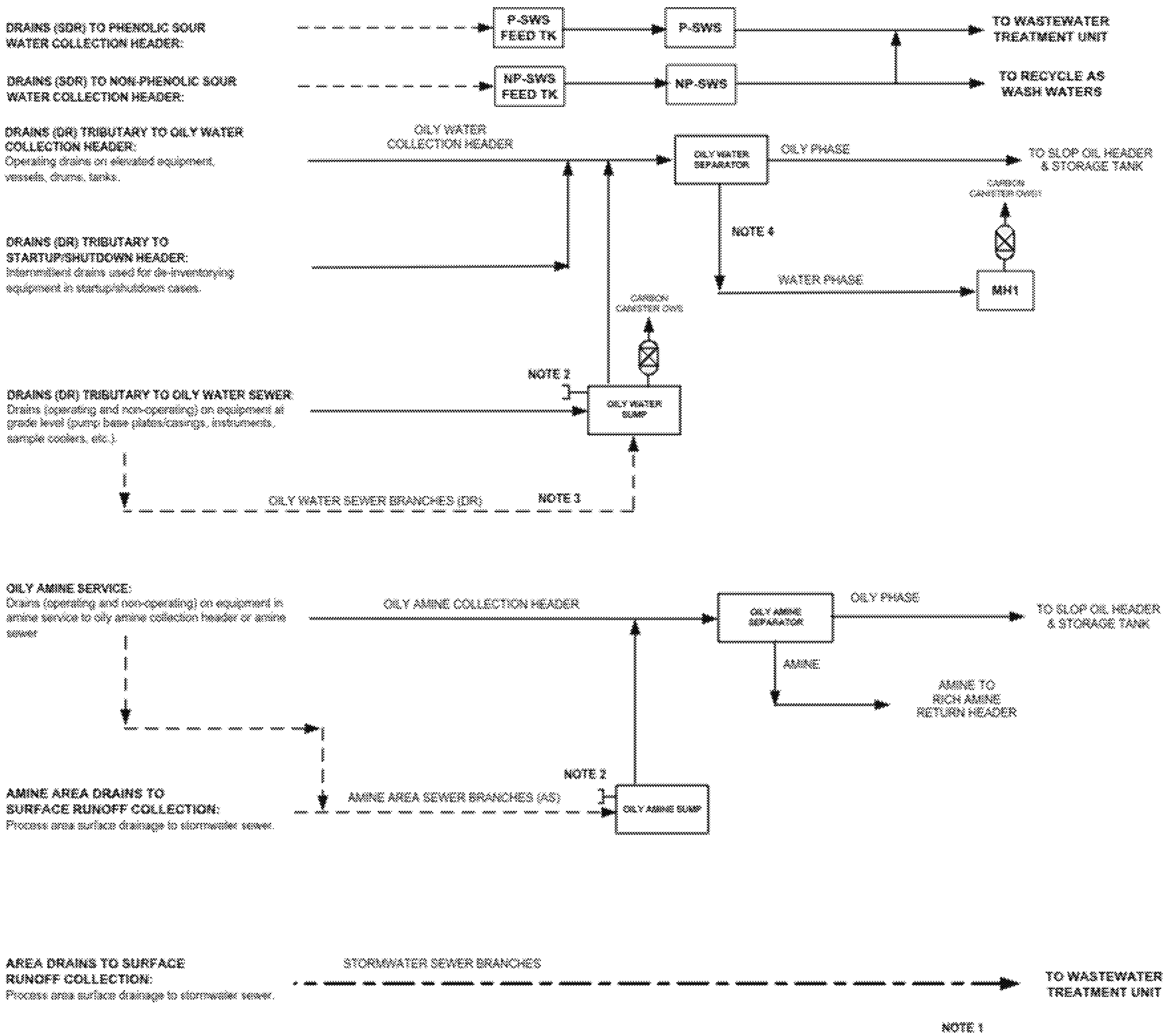
KBR

BLOCK FLOW DIAGRAM FOR PERMITTING BASIS
BLOCK 8000 – WASTE WATER MANAGEMENT
DIRECT COAL HYDROGENATION (DCH) PLANT
DALE, INDIANA

CLASS	JOB NO.	DOCUMENT NO.	SHEET	REV
	CLIENT	CLIENT RIVERVIEW ENERGY CORPORATION		
	KBR H102	KBR		

BLOCK 8000

VCC UNIT WASTE WATER COLLECTION AND CONVEYANCE



NOTES:

1. VCC UNIT ISBL STORM SEWER SYSTEM DESIGNED TO BE COMPLIANT WITH 40 CFR 60, SUBPART QQQ AND 40 CFR 61, SUBPART FF (BWON). STORMWATER CONVEYED TO WASTEWATER TREATMENT SYSTEM IN BLOCK 8000

2. VCC UNIT OILY WATER SUMP AND AMINE SUMP PUMP TO THEIR RESPECTIVE SEPARATORS. SUMP HAS 4" (MIN) BOTTOM SUCTION LINE TO ENABLE REMOVAL OF CONTENTS BY VACUUM TRUCK.

3. VCC UNIT SEWERS AND SUMP VENTS TO BE COMPLIANT WITH 40 CFR 60, SUBPART QQQ. DRAINS TO HAVE WATER SEALS OR HARD-PIPED SEWER CONNECTIONS. OILY WATER SUMP CONSERVATIVELY CONSIDERED SUBJECT TO BWON AND REQUIRES VENT CONTROL BY CARBON CANISTER.

4. OILY WATER SEPARATOR WATER SIDE CONTENTS PUMPED TO EITHER MH1 OR OTHER SEWER TIE-IN LOCATION WITH CARBON CANISTER VENT CONTROL.

QQQ OILY WATER & AMINE SEWERS (UNDERGROUND)

QQQ STORMWATER SEWER PIPE (UNDERGROUND)

COLLECTION HEADER PIPE (ABOVEGROUND)

NOTES:

LEGEND:

XX00 = PROCESS BLOCK OR PLANT AREA NUMBER

ISSUE	REV	DATE	REVISION DESCRIPTION	BY	CHK	APP	CLIENT
IFP	3	9OCT18	APPLICATION REVISIONS TO DATE	RN	SAL	BP	
IFP	2	15MAY18	APPLICATION REVISIONS TO DATE	RN	SAL	BP	
IFP	1	18JAN18	ISSUE FOR PERMIT	RN	SAL	BP	
IFI	0	28NOV17	ISSUE FOR INFORMATION	RN	SAL		

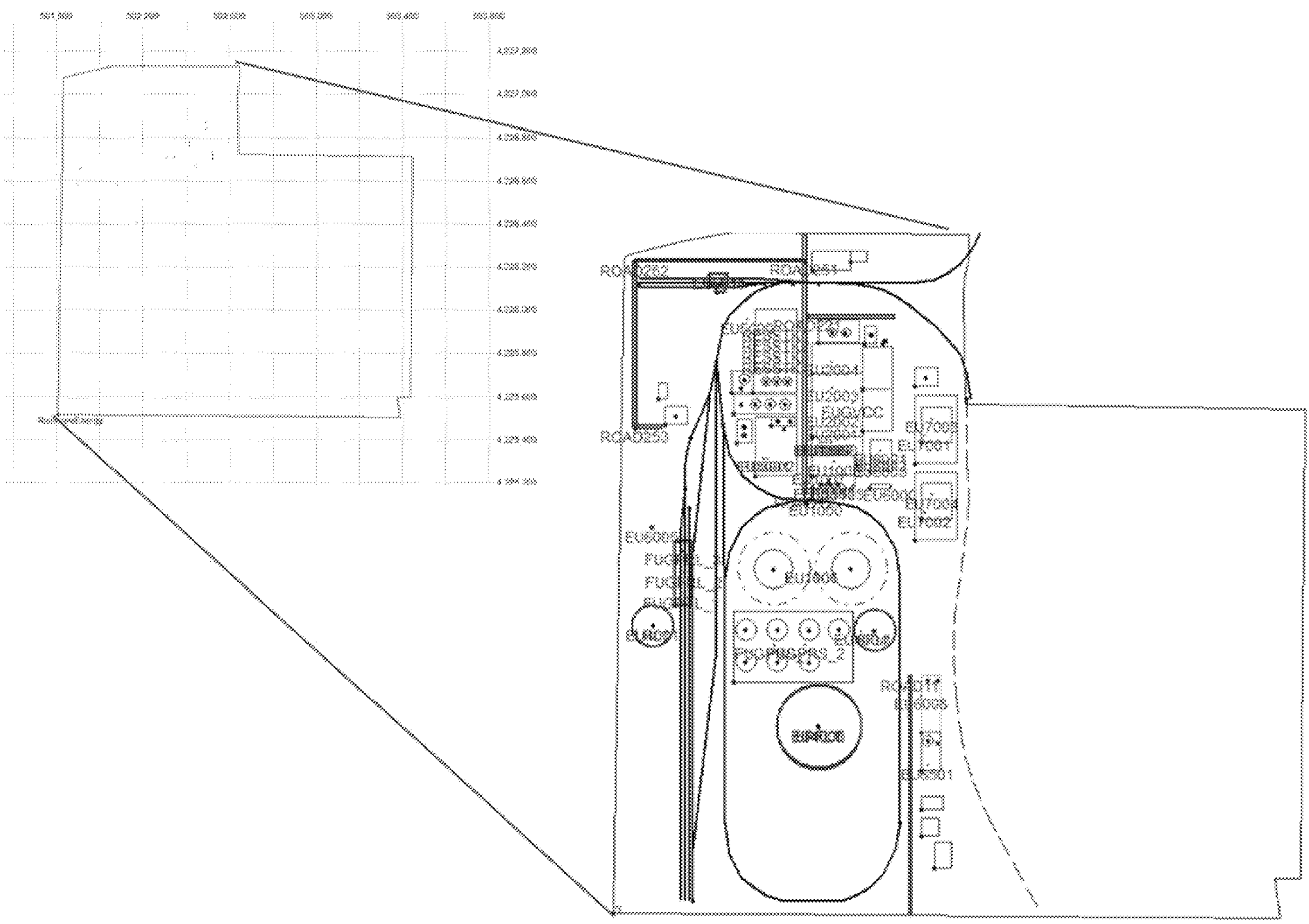
RIVERVIEW ENERGY CORPORATION

KBR

BLOCK FLOW DIAGRAM FOR PERMITTING BASIS
BLOCK 8000 – VCC WASTE WATER MANAGEMENT
DIRECT COAL HYDROGENATION (DCH) PLANT
DALE, INDIANA

CLASS	JOB NO.	DOCUMENT NO.	SHEET	REV
	CLIENT	CLIENT RIVERVIEW ENERGY CORPORATION		
	KBR H102	KBR H102-8000-EV-DWG-EV2-0002	1 OF 1	

Attachment D – Fenceline and Emission Source Location on UTM Grid



Attachment E – Emission Source Identification Table

Description	Model ID	Type	Location UTM (Zone 16)			Modeled Exhaust Parameters				Modeled Emission Rates (g/s)				
			Easting (X) (m)	Northing (Y) (m)	Base Elevation (Z) (m msl)	Stack Height (m)	Exit Temp (K)	Exit Velocity (m/s)	Stack Diameter (m)	PM10	PM2.5	NO2	CO	SO2
POINT SOURCES														
Feed Heater	EU-2001	point	502324.63	4226674.74	147.83	60.96	547	11.47	1.6	0.121	0.121	0.647	0.582	0.0288
Treat Gas Heater	EU-2002	point	502324.66	4226705.21	147.83	60.96	480.4	11.4	0.96	0.05	0.05	0.266	0.24	0.0119
Vac Column Feed Heater	EU-2003	point	502324.72	4226766.15	147.83	60.96	699.8	11.4	0.48	0.009	0.009	0.046	0.041	0.002
Fractionator Feed Heater	EU-2004	point	502324.77	4226827.08	147.83	60.96	488.7	11.35	1.67	0.147	0.147	0.786	0.707	0.035
TGTU Stack A	EU-3001	point	502161.3	4226598.71	147.83	60.96	549.3	12.1	1.118	0.035	0.035	0.845	0.19	1.576
TGTU Stack B	EU-3002	point	502172.2	4226598.71	147.83	60.96	549.3	12.1	1.118	0.035	0.035	0.845	0.19	1.576
HP Flare	EU-4006	point	502293.3	4225956.99	147.83	45.72	1273	20	0.4	0.0068	0.0068	0.056	0.3024	0.0015
LP Flare	EU-4005	point	502293.3	4225960.04	147.83	45.72	1273	20	0.4	0.0068	0.0068	0.056	0.3024	0.0015
Sulfur Block Flare	EU-4004	point	502394.74	4226188.43	147.83	45.72	1273	20	0.1	0.0009	0.0009	0.007	0.0002	0.0087
Loading Flare	EU-4001	point	501899.19	4226198.91	147.83	45.72	1273	20	0.1	0.0009	0.0009	0.007	0.0002	0.0087
Cooling Tower Cell A	EU-6001	point	502441.0	4226616.5	147.83	23.16	-6	8.56	6.4	0.0047	1.70E-05	0	0	0
Cooling Tower Cell B	EU-6002	point	502441.0	4226601.51	147.83	23.16	-6	8.56	6.4	0.0047	1.70E-05	0	0	0
Cooling Tower Cell C	EU-6003	point	502441.0	4226586.52	147.83	23.16	-6	8.56	6.4	0.0047	1.70E-05	0	0	0
Package Boiler	EU-6000	point	502462.22	4226528.95	147.83	30.48	477.6	11.63	1.07	0.065	0.065	0.343	0.311	0.0153
Emergency Diesel Generator	EU-6006	point	501897.85	4226431.37	147.83	4.72	683.2	55.4	0.406	0.0012	0.0012	0.049	0.0027	0.0007
Emergency Diesel Fire Water Pump	EU-6008	point	502537.34	4226034.7	147.83	4.72	683.2	55.4	0.406	0.0007	0.0007	0.022	0.0124	0.0004
Coal Milling and Drying Heater	EU-1007	point	502294.1	4226568.13	147.83	45.72	547	15.3	0.914	0.053	0.053	0.281	0.253	0.0126
Hydrogen Plant 1 Reformer	EU-7001	point	502544	4226650.17	147.83	50	432.6	11.58	3.45	0.6378	0.6378	0.693	2.1130	0.0344
Hydrogen Plant 2 Reformer	EU-7002	point	502543.8	4226467.35	147.83	50	432.6	11.58	3.45	0.6378	0.6378	0.693	2.1130	0.0344
Hydrogen Plant 1 Dearator Vent	EU-7003	point	502562.3	4226692.81	147.83	24.39	379.8	4.36	0.51	0	0	0	0.1474	0
Hydrogen Plant 2 Dearator Vent	EU-7004	point	502562.1	4226509.99	147.83	24.39	379.8	4.36	0.51	0	0	0	0.1474	0
Coal Unloading Station	EU-1000	Point	502286.35	4226493.37	147.83	15.24	293.2	16.7	0.508	0.0156	0.0156	0	0	0

Description	Model ID	Type	Location UTM (Zone 16)			Modeled Exhaust Parameters				Modeled Emission Rates (g/s)				
			Easting (X) (m)	Northing (Y) (m)	Base Elevation (Z) (m msl)	Stack Height (m)	Exit Temp (K)	Exit Velocity (m/s)	Stack Diameter (m)	PM10	PM2.5	NO2	CO	SO2
POINT SOURCES														
Coal Transfer Station	EU-1001	Point	502277.91	4226332.88	147.83	53.34	293.2	16.3	0.61	0.02	0.02	0	0	0
Reclaim Transfer Station	EU-1006	Point	502277.91	4226332.88	147.83	15.24	293.2	11.9	0.558	0.013	0.013	0	0	0
Coal Drying Loop Purge	EU-1008	Point	502329.59	4226588.90	147.83	15.24	331	9.2	1.0	0.033	0.033	0	0	0
Coarse Additive Storage Filter	EU-1501	Point	502298.06	4226533.23	147.83	37.00	293.2	8.8	0.254	0.002	0.002	0	0	0
Fine Additive Storage Filter	EU-1502	Point	502318.06	4226533.23	147.83	37.00	293.2	9.7	0.254	0.0022	0.0022	0	0	0
NA2S Additive Storage Filter	EU-1503	Point	502338.06	4226533.23	147.83	24.00	293.2	11.2	0.203	0.0017	0.0017	0	0	0
Fine Additive Production System	EU-1504	Point	502317.30	4226545.20	147.83	15.00	293.2	15.0	0.102	0.0006	0.0006	0	0	0
Coal Handling System Filter	EU-2005	Point	502296.80	4226635.98	147.83	37.00	293.2	11.6	0.102	0.0004	0.0004	0	0	0
Coarse Additive Handling System Filter	EU-2006	Point	502304.00	4226635.98	147.83	37.00	293.2	14.0	0.102	0.0005	0.0005	0	0	0
Fine Additive Handling System Filter	EU-2007	Point	502314.00	4226635.98	147.83	37.00	293.2	15.0	0.102	0.0005	0.0005	0	0	0
Na2S Handling System Filter	EU-2008	Point	502324.00	4226635.98	147.83	37.00	293.2	11.0	0.051	0.0001	0.0001	0	0	0
Residue Bulk Container Storage	EU-5009	Point	502125.00	4226925.00	147.83	15	293.2	10.5	0.0762	0.0001	0.0001	0	0	0
Residue Rail Silo Filter	EU-5010	Point	502058.57	4227032.86	147.83	40	293.2	9.3	0.102	0.00035	0.00035	0	0	0
Residue Swing Silo Filter	EU-5011	Point	502060.57	4227032.86	147.83	40	293.2	9.3	0.102	0.00035	0.00035	0	0	0
Lime Handling Silo	EU-6501	Point	502552.14	4225867.67	147.83	37	293.2	8.1	0.203	0.0012	0.0012	0	0	0

LINE SOURCES												
Description	Model ID	Type	Road Segment Endpoints UTM					Height (m)	Width (m)	Sigma z (m)	Modeled Emissions (g/s)	
			Start X (m)	Start Y (m)	End X (m)	End Y (m)	Z (m msl)				PM10	PM2.5
Paved Road Segment N-S from Gate 2 to VCC SRU	ROAD12	line	502258.34	4226511.98	502260.15	4227126.5	147.83	3	6.1	2	2.41E-05	5.91E-06
Paved Road Segment E-W from Gate 2 to Ammonia Unloading	ROAD251	line	502260.15	4227064.89	501855.89	4227063.1	147.83	3	6.1	2	6.56E-03	1.61E-03
Paved Road Segment N-S to Ammonia Loading	ROAD252	line	501857.71	4227063.08	501857.71	4226667.9	147.83	3	6.1	2	4.53E-05	1.11E-05
Paved Road Segment E-W to Ammonia Unloading area	ROAD253	line	501857.71	4226669.7	501921.16	4226671.5	147.83	3	6.1	2	4.53E-05	1.11E-05
Paved Road Segment E-W from gate 2 to DMDS and Aniline unloading	ROAD221	line	502266.39	4226932.24	502473.54	4226929.8	147.83	3	6.1	2	6.29E-07	1.54E-07
Paved Road Segment N-S from South Entry Gate 1	ROAD11	line	502510.32	4226080.16	502512.13	4225512.8	147.83	3	6.1	2	1.39E-04	3.42E-05

HAPS, Hydrogen Sulfide (H2S) and Ammonia (NH3) – POINT SOURCES

Description	Model ID	Location UTM (Zone 16)			Modeled Exhaust Parameters				Modeled Emission Rates (g/s)					
		Easting (X) (m)	Northing (Y) (m)	Base Elevation (Z) (m msl)	Stack Height (m)	Exit Temp (K)	Exit Velocity (m/s)	Stack Diameter (m)	Hexane	Toluene	Benzene	Meth-anol	H2S	NH3
Feed Heater	EU-2001	502324.63	4226674.74	147.83	60.96	547	7.1	2.032	0.0285	0.0001	0.00003	0	0	0
Treat Gas Heater	EU-2002	502324.66	4226705.21	147.83	60.96	480.4	2.6	2.032	0.0118	0.00002	0.00001	0	0	0
Vac Column Feed Heater	EU-2003	502324.72	4226766.15	147.83	60.96	699.8	6.1	0.66	0.0020	0.00000	0.00000	0	0	0
Fractionator Feed Heater	EU-2004	502324.77	4226827.08	147.83	60.96	488.7	7.7	2.032	0.0347	0.0001	0.00004	0	0	0
TGTU Stack A	EU-3001	502161.3	4226598.71	147.83	60.96	549.3	13	1.118	0.0168	0.00003	0.00002	0	0.112	0
TGTU Stack B	EU-3002	502172.2	4226598.71	147.83	60.96	549.3	13	1.118	0.0168	0.00003	0.00002	0	0.112	0
Package Boiler	EU-6000	502462.22	4226528.95	147.83	30.48	477.6	3.5	2.286	0.0151	0.000028	0.00002	0		
Coal Milling and Drying Heater	EU-1007	502294.1	4226568.13	147.83	45.72	547	15.3	0.914	0.0124	0.000023	0.00001	0	0	0
Hydrogen Plant 1 Reformer	EU-7001	502544	4226650.17	147.83	30.48	432.6	11.58	3.45	0.0000	0.0000	0.0000	0	0	0.0077
Hydrogen Plant 2 Reformer	EU-7002	502543.8	4226467.35	147.83	30.48	432.6	11.58	3.45	0.0000	0.0000	0.0000	0	0	0.0077
Hydrogen Plant 1 Dearator Vent	EU-7003	502562.3	4226692.81	147.83	24.39	379.8	4.36	0.51	0.0000	0.0000	0.0000	0.408	0	0.543
Hydrogen Plant 2 Dearator Vent	EU-7004	502562.1	4226509.99	147.83	24.39	379.8	4.36	0.51	0.0000	0.0000	0.0000	0.408	0	0.543
Totally Enclosed Waste Water Treatment System Vent	EU-8001	502558.13	4226017.27	147.83	15	293.15	10.42	0.3047	--	--	0.00695	--	--	--

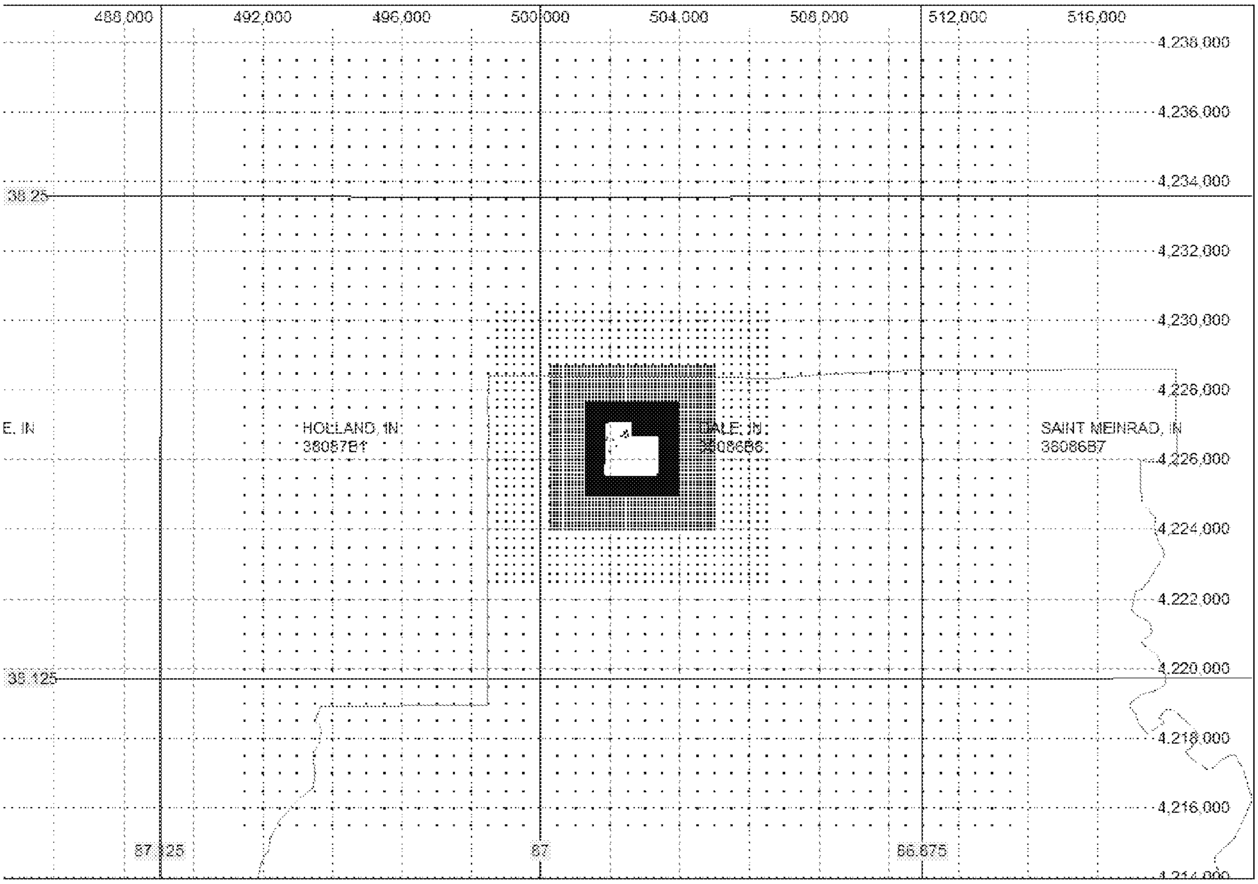
HAPS - VOLUME SOURCES

Description	Model ID	Easting (X) (m)	Northing (Y) (m)	Base Eleva-tion (Z) (m msl)	Release Height (m)	Sigma y (m)	Sigma z (m)	Modeled Emissions (g/s)						
								Xylene	Hexa-ne	Toluene	Benzene	Phenol	o-Cresol	m+p-Cresol
Fugitives - VCC Process Area	FUGVCC	502373.9	4226728.8	147.83	4	51.16	3.72	0.0094	0.0074	0.0075	0.0028	0.0075	0.0028	0.0075
Fugitives - Product Storage (Diesel, Naphtha) –Section 1	FUGPRS_1	502187.3	4226154.7	147.83	4	30.29	3.72	2.12E-04	1.70E-04	1.70E-04	6.37E-05	2.12E-06	5.09E-06	2.12E-06

Fugitives - Product Storage (Diesel, Naphtha) –Section 2	FUGPRS_2	502261.9	4226154.7	147.83	4	30.29	3.72	2.12E-04	1.70E-04	1.70E-04	6.37E-05	2.12E-06	5.09E-06	2.12E-06
Description	Model ID	Easting (X) (m)	Northing (Y) (m)	Base Elevation (Z) (m msl)	Release Height (m)	Sigma y (m)	Sigma z (m)	Modeled Emissions (g/s)						
								Xylene	Hexane	Toluene	Benzene	Phenol	o-Cresol	m+p-Cresol
Fugitives - Product Loading (Diesel, Naphtha) –Section 1	FUGPRL_1	501969.1	4226274.3	147.83	4	11.74	3.72	1.67E-04	1.34E-04	1.34E-04	5.01E-05	1.67E-06	4.01E-06	1.67E-06
Fugitives - Product Loading (Diesel, Naphtha) –Section 2	FUGPRL_2	501973.3	4226325.0	147.83	4	11.74	3.72	1.67E-04	1.34E-04	1.34E-04	5.01E-05	1.67E-06	4.01E-06	1.67E-06
Fugitives - Product Loading (Diesel, Naphtha) –Section 3	FUGPRL_3	501970.5	4226377.1	147.83	4	11.74	3.72	1.67E-04	1.34E-04	1.34E-04	5.01E-05	1.67E-06	4.01E-06	1.67E-06

Table Note: Emissions of nitrogen dioxide (NO2) will be modeled based on full conversion.

Attachment F – Receptor Location on UTM Grid



Attachment G – Buildings, Structures and Tanks

Buildings and Structures, Modeled Dimensions

Building Description	Number of Tiers	Tier Number	N-S Dimen. (ft)	E-W Dimen. (ft)	Height (ft)
Admin Building	1	1	131.2	196.8	25
Control Room	1	1	295.2	147.6	30
Maintenance Workshop	1	1	164	98.4	40
Laboratory and Analytical Building	1	1	131.2	82	30
Warehouse/Storage	1	1	131.2	131.2	40

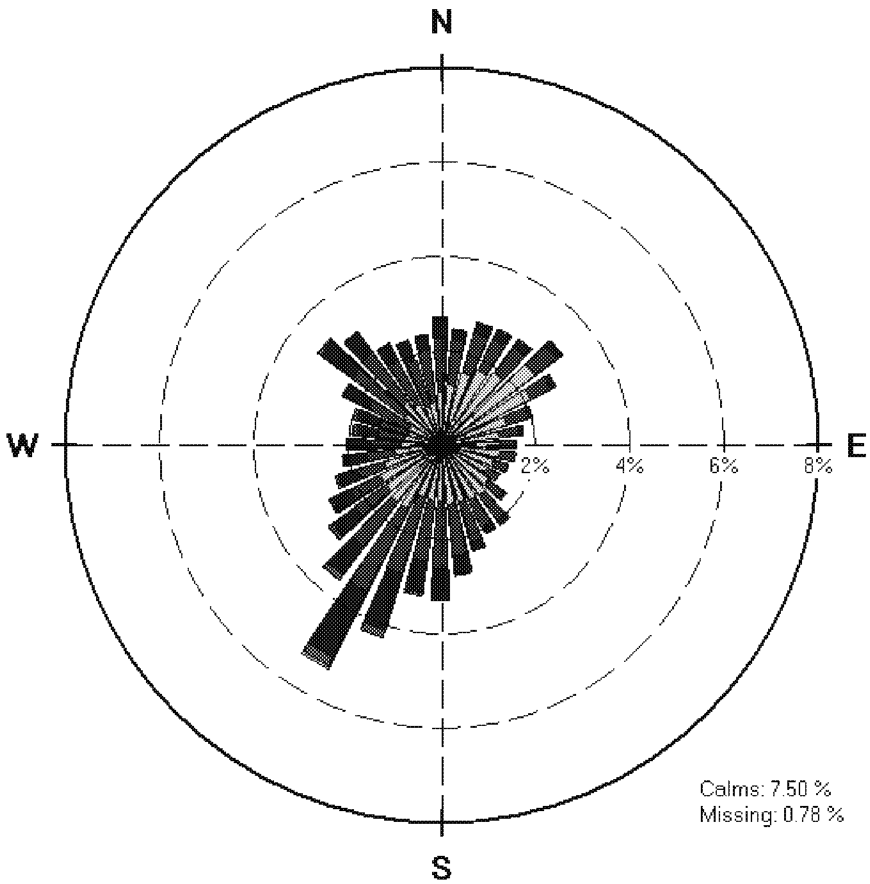
Tanks, Modeled Dimensions

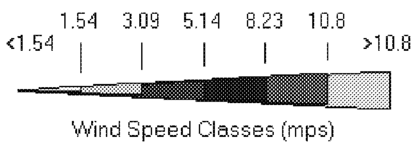
Service	Tank Type	Tank Height ft	Diameter ft
Product Storage			
Naphtha Product Tank 1	IFR	47.9	160.1
Naphtha Product Tank 2	IFR	47.9	160.1
Diesel Product Tank 1	Fixed Roof	47.9	160.1
Diesel Product Tank 2	Fixed Roof	47.9	160.1
Diesel Product Tank 3	Fixed Roof	47.9	160.1
Diesel Product Swing Tank	IFR	47.9	160.1
Molten Sulfur Tank 1	Fixed Roof	47.9	42.7
Molten Sulfur Tank 2	Fixed Roof	47.9	42.7
Intermediate Storage			
Residue Surge Tank (VR LPH) 1	Fixed Roof	47.9	69.9
Residue Surge Tank (VR LPH) 2	Fixed Roof	47.9	69.9
Residue Feed Tank	Fixed Roof	47.9	69.9
VGO Tank 1	Fixed Roof	47.9	69.9
VGO Tank 2	Fixed Roof	47.9	69.9
Slop Tank	Fixed Roof	40.0	160.1

Service	Tank Type	Tank Height ft	Diameter ft
Auxiliaries Storage			
Diesel Fuel Storage Tank	Fixed Roof	16.1	21.3
Non-Phenolic Sour Water Storage Tank 1	Fixed Roof	47.9	80.1
Non-Phenolic Sour Water Storage Tank 2	Fixed Roof	47.9	80.1
Non-Phenolic Sour Water Storage Tank 3	Fixed Roof	47.9	80.1
Phenolic Sour Water Storage Tank	Fixed Roof	24.0	21.3
Stripped Non-Phenolic Sour Water Surge Tank	Fixed Roof	47.9	80.1
Stripped Phenolic Sour Water Surge Tank	Fixed Roof	16.1	21.3
Amine Surge/Deinventory Tank	Fixed Roof	16.1	25.9
Fresh Amine Tank	Fixed Roof	16.1	25.9
Amine Containment Tank	Fixed Roof	5.9	3.9
Water Trt Sulfuric Acid Tank	Fixed Roof	16.1	7.9
Water Trt Caustic Tank	Fixed Roof	16.1	7.9
Potable Water Storage Tank	Fixed Roof	16.1	15.1
Demin Water Storage Tank	Fixed Roof	40	85
Chemicals Storage			
Soda Ash Mix Tank	Fixed Roof	40	37
Solids Inventory			
Raw Coal Bunker (Milling Feed)			
Fine Additive Storage Silo	NOTE 1	100	30.0
Coarse Additive Storage Silo	NOTE 1	100	26.0
Sodium Sulfide Additive Storage Silo	NOTE 1	35	10.0
Coal Pile Dome 1	Geodesic Dome (assumed cylindrical)	175	300
Coal Pile Dome 2	Geodesic Dome (assumed cylindrical)	175	300

Note 1: Additive storage silos supported by open frame structure, heights given are top of silo.

Attachment H – Five Year Wind Rose (2012-2016), Evansville Regional AP, IN





Note: Diagram of the frequency of occurance
of each wind direction.

Met File Type: AERMET SFC
File: EVV-ILX2012_2016.SFC

WINDROSE

Station No. 93817
EVANSVILLE REGIONAL AP, IN
Period: 1/1/2012 - 12/31/2016

Attachment I – Existing Sources in Indiana and Kentucky included in NAAQS Modeling

KBR

ENVIRONMENTAL NAAQS MODELING INPUT

CLIENT	Riverview Energy Corporation	DOC. NO.	H102-0000-EV-LST-EV2-0003
JOB NO.	H102	PURPOSE	IFI - ISSUED FOR INFORMATION
SUBJECT	NAAQS Modeling Source Input for sources in Indiana		Permit Development
			Updated to include PM2.5 emissions from sources based on IDEM input
BASED ON	IDEM Permits, EIR-923 Reports and IDEM NAAQS Inventory Data for 2016, IDEM emails		

Rev. No.	A	B	C	D	E	F			
Date	7-Mar-18	14-Mar-18	12-Apr-18	6-Jun-18	27-Sep-18	3-Oct-18			
By:	RN	RN	RN	RN	RN	RN			
Check:	SAL	SAL	SAL	SAL	SAL	SAL			
Appr.	---	---	---	---	---	---			

NAAQS MODELING - OTHER SOURCES EMISSIONS DATA

Line	Rev	Year	State	County	County FIPS Code	IDEM Facility ID	Facility Name	Boiler ID	Point ID	Stack Release Type	Location UTM: Easting (X) (m)	Northing (Y) (m)			Base Elevation (Z) from Google Earth (ft msl)	Base Elevation (Z) from IDEM (m msl)	Exhaust Parameters: Stack Height (m)	Exit Temp (K)	Exit Velocity (m/s)	Stack Diameter (m)				Modeled Emissions (g/s): NO2	SO2	PM2.5	Remarks
1																											
4		2016	IN	Pike	18125	00002	Indianapolis Power and Light Petersburg	1	1-1(S)	Vertical	478000	4264200			446	135.23	189.28	323.71	14.62	4.66				253.20	42.13	102.63	
5		2016	IN	Pike	18125	00002	Indianapolis Power and Light Petersburg	2	2-1(S)	Vertical	478000	4264100			458	138.82	189.28	324.26	14.58	6.28				419.55	134.26	170.06	
6		2016	IN	Pike	18125	00002	Indianapolis Power and Light Petersburg	3	3-1	Vertical	478000	4264300			425	131.44	189.89	342.04	14.29	6.71				386.16	39.72	55.17	
7		2016	IN	Pike	18125	00002	Indianapolis Power and Light Petersburg	4	4-1	Vertical	478000	4264300			425	131.44	190.50	342.59	14.00	6.71				366.79	27.67	52.40	
8		2016	IN	Spencer	18147	00020	INDIANA MICHIGAN POWER DBA AEP ROCKPORT	MB1 and MB2	CS012	Vertical	496737	4197369			400	121.92	316.38	429.82	18.82	12.95				1617.20	2772.35	21.46	
9		2016	IN	Warrick	18173	00002	ALCOA Warrick Power Plant AGC Div of Al	1	7	Vertical	470727	4196445			393	116.54	115.82	327.04	11.06	4.22				59.40	22.29	24.13	
10		2016	IN	Warrick	18173	00002	ALCOA Warrick Power Plant AGC Div of Al	2	8	Vertical	470732	4196445			393	116.59	115.82	325.93	10.84	4.11				55.86	20.96	22.69	
11		2016	IN	Warrick	18173	00002	ALCOA Warrick Power Plant AGC Div of Al	3	9a	Vertical	470737	4196445			393	116.64	115.82	327.59	11.12	4.11				59.97	22.50	24.36	
12		2016	IN	Warrick	18173	00002	ALCOA Warrick Power Plant AGC Div of Al	4	10	Vertical	470720	4196340			393	120.97	152.40	325.93	12.43	5.79				219.46	53.55	57.98	
13		2016	IN	Warrick	18173	00002	ALCOA Warrick LLC (ALCOA Operations)	ALCOAOP - GTC Potline #3 and #4	GTC	Vertical	470668	4196863			---	118.88	60.66	350.00	16.46	6.10				0.58	79.34	6.28	
14		2016	IN	Warrick	18173	00007	ALCOA Warrick LLC (ALCOA Operations)	ALCOAOP - Melter 1M1	134.62	Vertical	470735	4197193			---	119.17	38.40	472.00	2.16	1.59				0.16	9.0E-04	0.03	
15		2016	IN	Warrick	18173	00007	ALCOA Warrick LLC (ALCOA Operations)	ALCOAOP - Holder 1EH	134.64	Vertical	470710	4197190			---	119.18	38.40	445.00	2.00	1.22				0.15	1.4E-03	0.03	
16		2016	IN	Warrick	18173	00007	ALCOA Warrick LLC (ALCOA Operations)	ALCOAOP - Melter 1M2	134.65	Vertical	470710	4197201			---	119.06	38.40	472.00	2.16	1.59				0.40	2.0E-03	0.24	
17		2016	IN	Warrick	18173	00007	ALCOA Warrick LLC (ALCOA Operations)	ALCOAOP - Holder 1WH	134.66	Vertical	470968	4197128			---	119.18	38.40	445.00	2.00	1.22				0.15	3.0E-03	0.02	
18		2016	IN	Warrick	18173	00007	ALCOA Warrick LLC (ALCOA Operations)	ALCOAOP - Melter 5M1	134.33	Vertical	470983	4197133			---	119.18	38.40	583.00	3.80	1.22				0.25	4.0E-04	0.03	
19		2016	IN	Warrick	18173	00007	ALCOA Warrick LLC (ALCOA Operations)	ALCOAOP - Holder 5EH	134.35	Vertical	470968	4197128			---	119.18	38.40	466.00	2.34	1.37				0.32	1.3E-03	0.18	
20		2016	IN	Warrick	18173	00007	ALCOA Warrick LLC (ALCOA Operations)	ALCOAOP - Melter 5M2	134.36	Vertical	470963	4197135			---	119.18	38.40	583.00	3.80	1.22				1.32	4.0E-04	0.05	
21		2016	IN	Warrick	18173	00007	ALCOA Warrick LLC (ALCOA Operations)	ALCOAOP - Holder 5WH	134.38	Vertical	470941	4197138			---	119.41	38.40	466.00	2.34	1.37				0.32	1.3E-03	0.20	
22		2016	IN	Warrick	18173	00007	ALCOA Warrick LLC (ALCOA Operations)	ALCOAOP - Melter 5M3	134.39	Vertical	470943	4197141			---	119.38	38.40	583.00	3.80	1.22				0.30	4.0E-04	0.03	
23		2016	IN	Warrick	18173	00007	ALCOA Warrick LLC (ALCOA Operations)	ALCOAOP - Melter 6M1	134.4	Vertical	470933	4197145			---	119.48	38.40	583.00	3.80	1.22				0.04	2.0E-04	0.03	
24		2016	IN	Warrick	18173	00007	ALCOA Warrick LLC (ALCOA Operations)	ALCOAOP - Holder 6EH	134.41	Vertical	470923	4197141			---	119.48	38.40	466.00	2.34	1.37				0.02	1.0E-04	0.20	
25		2016	IN	Warrick	18173	00007	ALCOA Warrick LLC (ALCOA Operations)	ALCOAOP - Melter 6M2	134.42	Vertical	470923	4197148			---	119.48	38.40	583.00	3.80	1.22				0.04	2.0E-04	0.03	
26		2016	IN	Warrick	18173	00007	ALCOA Warrick LLC (ALCOA Operations)	ALCOAOP - Holder 6WH	134.43	Vertical	470913	4197143			---	119.48	38.40	466.00	2.34	1.37				0.02	1.0E-04	0.20	
27		2016	IN	Warrick	18173	00007	ALCOA Warrick LLC (ALCOA Operations)	ALCOAOP - Melter 6M3	134.44	Vertical	470913	4197148			---	119.48	38.40	583.00	3.80	1.22				0.04	2.0E-04	0.03	
28		2016	IN	Warrick	18173	00007	ALCOA Warrick LLC (ALCOA Operations)	ALCOAOP - Offlines #2 EM	134.71	Vertical	470926	4197245			---	119.93	30.78	583.00	5.20	1.04				1.14	6.0E-03	0.00	
29		2016	IN	Warrick	18173	00007	ALCOA Warrick LLC (ALCOA Operations)	ALCOAOP - Offlines #2 WM	134.75	Vertical	470886	4197261			---	119.39	30.78	555.00	0.83	1.52				0.66	2.5E-03	0.00	
30		2016	IN	Warrick	18173	00007	ALCOA Warrick LLC (ALCOA Operations)	ALCOAOP - Potline #2 A-398 160C1	P02M01	Vertical	471118	4196959.03			---	119.00	14.94	355.22	14.79	1.89				0.07	---	---	
31		2016	IN	Warrick	18173	00007	ALCOA Warrick LLC (ALCOA Operations)	ALCOAOP - Potline #2 A-398 160C1	P02M02	Vertical	471133	4196954.16			---	119.00	14.94	355.22	14.79	1.89				0.07	---	---	
32		2016	IN	Warrick	18173	00007	ALCOA Warrick LLC (ALCOA Operations)	ALCOAOP - Potline #2 A-398 160C1	P02M03	Vertical	471112	4196938.5			---	119.00	14.94	355.22	14.79	1.89				0.07	---	---	
33		2016	IN	Warrick	18173	00007	ALCOA Warrick LLC (ALCOA Operations)	ALCOAOP - Potline #2 A-398 160C1	P02M04	Vertical	471129	4196933.59			---	119.00	14.94	355.22	14.79	1.89				0.07	---	---	
34		2016	IN	Warrick	18173	00007	ALCOA Warrick LLC (ALCOA Operations)	ALCOAOP - Potline #5 A- 161B5	P03M01	Vertical	470771	4196912.35			---	119.00	14.94	350.22	18.82	1.54				0.05	---	---	
35		2016	IN	Warrick	18173	00007	ALCOA Warrick LLC (ALCOA Operations)	ALCOAOP - Potline #5 A- 161B5	P03M02	Vertical	470768	4196901.62			---	119.00	14.94	350.22	18.82	1.54				0.05	---	---	
36		2016	IN	Warrick	18173	00007	ALCOA Warrick LLC (ALCOA Operations)	ALCOAOP - Potline #5 A- 161B5	P03M03	Vertical	470765	4196891.26			---	119.00	14.94	350.22	18.82	1.54				0.05	---	---	
37		2016	IN	Warrick	18173	00007	ALCOA Warrick LLC (ALCOA Operations)	ALCOAOP - Potline #5 A- 161B5	P03M04	Vertical	470762	4196881.5			---	119.00	14.94	350.22	18.82	1.54				0.05	---	---	
38		2016	IN	Warrick	18173	00007	ALCOA Warrick LLC (ALCOA Operations)	ALCOAOP - Potline #5 A- 161B5	P03M05	Vertical	470759	4196870.89			---	119.00	14.94	350.22	18.82	1.54				0.05	---	---	
39		2016	IN	Warrick	18173	00007	ALCOA Warrick LLC (ALCOA Operations)	ALCOAOP - Potline #5 A- 161B5	P03M06	Vertical	470756	4196860.52			---	119.00	14.94	350.22	18.82	1.54				0.05	---	---	
40		2016	IN	Warrick	18173	00007	ALCOA Warrick LLC (ALCOA Operations)	ALCOAOP - Potline #6 A- 161B6	P04M01	Vertical	470750	4196918.21			---	119.00	14.94	350.78	15.65	1.54				0.05	---	---	
41		2016	IN	Warrick	18173	00007	ALCOA Warrick LLC (ALCOA Operations)	ALCOAOP - Potline #6 A- 161B6	P04M02	Vertical	470748	4196907.72			---	119.00	14.94	350.78	15.65	1.54				0.05	---	---	
42		2016	IN	Warrick	18173	00007	ALCOA Warrick LLC (ALCOA Operations)	ALCOAOP - Potline #6 A- 161B6	P04M03	Vertical	470745	4196897.6			---	119.00	14.94	350.78	15.65	1.54				0.05	---	---	
43		2016	IN	Warrick	18173	00007	ALCOA Warrick LLC (ALCOA Operations)	ALCOAOP - Potline #6 A- 161B6	P04M04	Vertical	470742	4196887.23			---	119.00	14.94	350.78	15.65	1.54				0.05	---	---	
44		2016	IN	Warrick	18173	00007	ALCOA Warrick LLC (ALCOA Operations)	ALCOAOP - Potline #6 A- 161B6	P04M05	Vertical	470739	4196876.62			---	119.00	14.94	350.78	15.65	1.54				0.05	---	---	
45		2016	IN	Warrick	18173	00007	ALCOA Warrick LLC (ALCOA Operations)	ALCOAOP - Potline #6 A- 161B6	P04M06	Vertical	470736	4196866.99			---	119.00	14.94	350.78	15.65	1.54				0.05	---	---	
46		2016	IN	Warrick	18173	00007	ALCOA Warrick LLC (ALCOA Operations)	ALCOAOP - Potline #2 A-398	160C1	Vertical	471118	4196953			---	119.96	14.94	366.00	21.12	3.70				---	27.33	0.75	
47		2016	IN	Warrick	18173	00007	ALCOA Warrick LLC (ALCOA Operations)	ALCOAOP - Potline #5 A-398	161B5	Vertical	470768	4196888			---	119.18	14.94	366.00	21.12	3.72				---	27.33	1.05	
48		2016	IN	Warrick	18173	00007	ALCOA Warrick LLC (ALCOA Operations)	ALCOAOP - Potline #6 A-398	161B6	Vertical	470746	4196888			---	119.18	14.94	366.00	21.12	3.69				---	27.33	1.07	
49		2016	IN	Dubois	18037	00051	MasterBrand Cabinets, Inc-# 4/22		No Stack Associated	Vertical	511333	4230193			400	121.92	2.00	255.37	0.001	0.001				---	---	0.002	Assumed as fugitive emissions. Fugitives modeled as psuedo-point sources with velocity of 0.001 m/s and stack diameter of 0.001 m. Release ht assumed as 2 m above base elevation.
50		2016	IN	Dubois	18037	00051	MasterBrand Cabinets, Inc-# 4/22		Fugitive	Fugitive	511333	4230193			400	121.92	2.00	255.37	0.001	0.001				---	---	0.12	
51		2016	IN	Dubois	18037	00051	MasterBrand Cabinets, Inc-# 4/22		Fugitive	Fugitive	511333	4230193			400	121.92	2.00	255.37	0.001	0.001				---	---	0.96	
52		2016	IN	Dubois	18037	00054	OFS BRANDS INC PLNT NO 1		Vertical	Vertical	505500	4235500			400	121.92	9.14	299.82	28.96	0.91				---	---	0.01	
53		2016	IN	Spencer	18147	00044	NATIONAL OFFICE FURNITURE NOF SANTA CL		Vertical	Vertical	503800	4218800			400	121.92	9.14	298.15	11.48	0.40				---	---	0.0001	
54		2016	IN	Spencer	18147	00044	NATIONAL OFFICE FURNITURE NOF SANTA CL		Vertical	Vertical	503800	4218800			400	121.92	8.23	298.15	9.31	0.82				---	---	0.003	
55																											
56											Start Easting (Xs1) (m)	Start Northing (Ys1) (m)	End Easting (Xs2) (m)	End Northing (Ys2) (m)		Base Elevation (m)	Release Height (m)	Average Building Length (L) (m)	Average Building Height (HB) (m)	Avergae Building Width (WB) (m)	Average Line Source Width (WM) (m)	Average Building Separation (DX) (m)	Average Buoyance Parameter (FPRIME) (m4/s3)				
57		2016	IN	Warrick	18173	00007	ALCOA Warrick LLC (ALCOA Operations)	ALCOAOP - Bouyancy Line Sources	103M1	BuoyLine	471119	4196702	471198	4196984	---	120.58	14.02	292.60	13.61	16.00	1.52	20.57	1002.19	0.003	0.266	1.162	
58		2016	IN	Warrick	18173	00007	ALCOA Warrick LLC (ALCOA Operations)	ALCOAOP - Bouyancy Line Sources	104M1	BuoyLine	471087	4196711	471166	4196993	---	120.07	14.02							0.003	0.266	1.162	
59		2016	IN	Warrick	18173	00007	ALCOA Warrick LLC (ALCOA Operations)	ALCOAOP - Bouyancy Line Sources	105M1	BuoyLine	471024	4196728	471103	4197010	---	119.09	14.02							0.003	0.269	1.578	
60		2016	IN	Warrick	18173	00007	ALCOA Warrick LLC (ALCOA Operations)	ALCOAOP - Bouyancy Line Sources	106M1	BuoyLine	470992	4196737	471070	4197019	---	119.00	14.02							0.003	0.269	1.578	
61		2016	IN	Warrick	18173	00007	ALCOA Warrick LLC (ALCOA Operations)	ALCOAOP - Bouyancy Line Sources	107M1	BuoyLine	470961	4196745	471038	4197027	---	119.01	14.02							0.003	0.269	1.571	
62		2016	IN	Warrick	18173	00007	ALCOA Warrick LLC (ALCOA Operations)	ALCOAOP - Bouyancy Line Sources	108M1	BuoyLine	470929	4196754	471007	4197036	---	118.97	14.02							0.003	0.269	1.571	
63		2016	IN	Warrick	18173	00007	ALCOA Warrick LLC (ALCOA Operations)	ALCOAOP - Bouyancy Line Sources	109M1	BuoyLine	470900	4196760	470970	4197050	---	119.18	14.02							0.003	0.259	1.304	
64		2016	IN	Warrick	18173	00007	ALCOA Warrick LLC (ALCOA Operations)	ALCOAOP - Bouyancy Line Sources	110M1	BuoyLine	470860	4196770	470940	4197050	---	119.30	14.02							0.003	0.259	1.304	
65		2016	IN	Warrick	18173	00007	ALCOA Warrick LLC (ALCOA Operations)	ALCOAOP - Bouyancy Line Sources	111M1	BuoyLine	470803	4196780	470880	4197070	---	119.09	14.02							0.003	0.264	1.474	
66		2016	IN	Warrick	18173	00007	ALCOA Warrick LLC (ALCOA Operations)	ALCOAOP - Bouyancy Line Sources	112M1	BuoyLine	470771	4196790	470850	4197080	---	119.00	14.02							0.003	0.264	1.474	

KBR

ENVIRONMENTAL NAAQS MODELING INPUT

CLIENT	Riverview Energy Corporation	**DOC. NO.**	H102-0000-EV-LST-EV2-0004	A	B					
JOB NO.	H102	**PURPOSE**	IFI - ISSUED FOR INFORMATION	5-Mar-18	27-Sep-18					
SUBJECT	NAAQS Modeling Source Input for sources in Kentucky		Permitting	RN	RN					
			Updated to include PM2.5 emissions	SAL	SAL					
BASED ON	KYDEP NAAQS Inventory Data for 2016			---						

NAAQS MODELING - OTHER SOURCES EMISSIONS DATA

Rev	Year	State	County	County FIPS Code	KYDEP Facility ID	KYDEP AI ID	Facility Name	Point ID	Stack Release Type	Location (decimal degrees)		Location UTM				Exhaust Parameters				Modeled Emissions (g/s)		
										Longitude	Latitude	Easting (X) (m)	Northing (Y) (m)	Base Elevation (Z) from Google Earth (ft msl)	Base Elevation (Z) from Google Earth (m msl)	Stack Height (m)	Exit Temp (K)	Exit Velocity (m/s)	Stack Diameter (m)	NO2	SO2	PM2.5
	2016	KY	Daviess	21059	2105900039	938	Owensboro Grain Co LLC	46 01 - 1	Point	-87.103056	37.775556	490924	4180917	397	121.01	32.92	429.82	14.94	1.40	5.11	12.35	8.69E-04
	2016	KY	Daviess	21059	2105900039	938	Owensboro Grain Co LLC	50 01 - 1	Point	-87.103056	37.775556	490924	4180917	397	121.01	9.14	453.15	4.30	0.61	1.30	0.00	0.12
	2016	KY	Daviess	21059	2105900027	942	Owensboro Municipal Utilities - Elmer Smith Station	EU002 - 1	Point	-87.060833	37.794167	494644	4182979	408	124.36	128.02	322.04	17.76	7.32	61.74	44.11	0.42
	2016	KY	Daviess	21059	2105900027	942	Owensboro Municipal Utilities - Elmer Smith Station	EU002 - 2	Point	-87.060833	37.794167	494644	4182979	408	124.36	128.02	322.04	17.76	7.32	0.28	0.0	0.00E+00
	2016	KY	Daviess	21059	2105900027	942	Owensboro Municipal Utilities - Elmer Smith Station	EU001 - 1	Point	-87.060833	37.794167	494644	4182979	408	124.36	128.02	322.04	17.76	7.32	25.80	26.31	0.82
	2016	KY	Hancock	21091	2109100005	43431	Domtar Paper Co LLC - Hawesville Operations Bleached Pulp Mill	EU-42 - 1	Point	-86.686111	37.893889	527598	4194088	417	127.10	60.05	452.04	15.07	3.66	5.71	0.08	0.26
	2016	KY	Hancock	21091	2109100005	43431	Domtar Paper Co LLC - Hawesville Operations Bleached Pulp Mill	EU-42 - 2	Point	-86.686111	37.893889	527598	4194088	417	127.10	60.05	452.04	15.07	3.66	1.44	0.01	2.73E-04
	2016	KY	Hancock	21091	2109100005	43431	Domtar Paper Co LLC - Hawesville Operations Bleached Pulp Mill	EU-36 - 2	Point	-86.686111	37.893889	527598	4194088	417	127.10	45.11	487.59	5.63	2.44	1.02	0.01	1.94E-04
	2016	KY	Hancock	21091	2109100005	43431	Domtar Paper Co LLC - Hawesville Operations Bleached Pulp Mill	EU-40 - 1	Point	-86.686111	37.893889	527598	4194088	417	127.10	29.87	349.82	5.23	1.07	1.81	0.22	0.74
	2016	KY	Hancock	21091	2109100005	43431	Domtar Paper Co LLC - Hawesville Operations Bleached Pulp Mill	EU-29 - 1	Point	-86.686111	37.893889	527598	4194088	417	127.10	82.91	464.26	19.48	3.05	15.24	0.07	1.74
	2016	KY	Hancock	21091	2109100005	43431	Domtar Paper Co LLC - Hawesville Operations Bleached Pulp Mill	EU-30 - 1	Point	-86.686111	37.893889	527598	4194088	417	127.10	61.87	355.37	11.22	1.22	0.00	0.56	0.38
	2016	KY	Hancock	21091	2109100005	43431	Domtar Paper Co LLC - Hawesville Operations Bleached Pulp Mill	EU-27 - 1	Point	-86.686111	37.893889	527598	4194088	417	127.10	81.08	432.04	17.19	2.90	10.29	0.03	1.70
	2016	KY	Hancock	21091	2109100004	1634	Century Aluminum of KY LLC	41b - 5	Point	-86.786027	37.942082	518801	4199410	410	124.97	60.96	366.48	11.77	2.74	0.30	0.00	2.05E-04
	2016	KY	Hancock	21091	2109100004	1634	Century Aluminum of KY LLC	41b - 6	Point	-86.786027	37.942082	518801	4199410	410	124.97	60.96	366.48	11.77	2.74	0.90	2.48	0.10
	2016	KY	Hancock	21091	2109100004	1634	Century Aluminum of KY LLC	84b - 4	Point	-86.786027	37.942082	518801	4199410	410	124.97	9.14	366.48	20.95	6.86	0.91	4.95	0.48
	2016	KY	Hancock	21091	2109100004	1634	Century Aluminum of KY LLC	84b - 2	Point	-86.786027	37.942082	518801	4199410	410	124.97	9.14	366.48	20.95	6.86	0.93	5.08	0.49
	2016	KY	Hancock	21091	2109100004	1634	Century Aluminum of KY LLC	88 - 1	Point	-86.786027	37.942082	518801	4199410	410	124.97	0.00	297.04	0.00	0.00	0.15	1.02	0.82
	2016	KY	Hancock	21091	2109100004	1634	Century Aluminum of KY LLC	86 - 1	Point	-86.786027	37.942082	518801	4199410	410	124.97	0.00	297.04	0.00	0.00	0.16	1.05	0.85
	2016	KY	Hancock	21091	2109100010	1622	Aleris Rolled Products Inc	046	Point	-86.846944	37.949167	518801	4199410	410	124.97	18.29	304.82	14.44	1.71	----	---	0.33
	2016	KY	Hancock	21091	2109100010	1622	Aleris Rolled Products Inc	045	Point	-86.846944	37.949167	518801	4199410	410	124.97	26.83	304.82	17.67	1.37	---	---	0.36

Attachment J – Emission Source Parameters for Planned Flaring Events

1. Flaring Event 1 – Hydrogen Plant 2 Commissioning/Cold Start-up - Reformer Vent

In addition to the LP Flare, the following sources will be operating at reduced capacities during this planned flaring event.

Table 1: Planned Flaring Event 1 – Hydrogen Plant 2 Commissioning/Cold Start-up – Reformer Vent

S.No.	Description	Model ID	Type	% Design	Modeled Exhaust Parameters				Modeled Emission Rates (g/s)		
					Stack Height (m)	Exit Temp (K)	Exit Velocity (m/s)	Stack Diameter (m)	NO2	SO2	CO
1	Feed Heater	EU-2001	point	50%	60.96	547	5.74	1.6	0.3235	0.0144	0.291
2	Treat Gas Heater	EU-2002	point	50%	60.96	480.4	5.70	0.96	0.133	0.00595	0.12
3	Vac Column Feed Heater	EU-2003	point	50%	60.96	699.8	5.70	0.48	0.023	0.001	0.0205
4	Fractionator Feed Heater	EU-2004	point	50%	60.96	488.7	5.68	1.67	0.393	0.0175	0.3535
5	TGTU Stack A	EU-3001	point	50%	60.96	549.3	6.05	1.118	0.422	0.788	0.095
6	TGTU Stack B	EU-3002	point	50%	60.96	549.3	6.05	1.118	0.422	0.788	0.095
7	HP Flare	EU-4006	point	Pilot and Purge	45.72	1273	20.00	0.4 (Eff. Dia)	0.056	0.0015	0.3024
8	LP Flare	EU-4005	point	Scenario Flaring	45.72	1273	20.00	3.97 (Eff. Dia)	2.324	0.002	37.898
9	Sulfur Block Flare	EU-4004	point	Pilot and Purge	45.72	1273	20.00	0.1 (Eff. Dia)	0.007	0.0087	0.0002
10	Loading Flare	EU-4001	point	Pilot and Purge	45.72	1273	20.00	0.1 (Eff. Dia)	0.007	0.0087	0.0002
11	Package Boiler	EU-6000	point	50%	30.48	477.6	5.815	1.07	0.1715	0.00765	0.1555
12	Emergency Diesel Generator	EU-6006	point	0%	4.72	683.2	0.00	0.406	0	0	0
13	Emergency Diesel Fire Water Pump	EU-6008	point	0%	4.72	683.2	0.00	0.406	0	0	0
14	Coal Milling and Drying Heater	EU-1007	point	50%	45.72	547	7.65	0.914	0.1405	0.0063	0.1265
15	Hydrogen Plant 1 Reformer	EU-7001	point	100%	50	432.6	5.79	3.45	0.3465	0.0344	2.113
16	Hydrogen Plant 2 Reformer	EU-7002	point	0%	50	432.6	0.00	3.45	0	0	0
17	Hydrogen Plant 1 DA Vent	EU-7003	point	100%	24.39	379.8	4.36	0.51	---	---	0.1474
18	Hydrogen Plant 2 DA Vent	EU-7004	point	0%	24.39	379.8	0.00	0.51	---	---	0
								Total =	**5.12**	**1.68**	**41.72**
	Flaring Event 1 Details:										
	Flare Heat Release Rate, cal/s =		1.9E+07								
	Flared gas molecular Weight, lb/lbmol =		12.39								
	Flare Effective Stack diameter, m =		3.97								

2. Flaring Event 2 – VCC Unit LPH Commissioning/Cold Start-up Purge

In addition to the HP Flare, the following sources will be operating at reduced capacities during this planned flaring event.

Table 2: Planned Flaring Event 2 – VCC Unit LPH Commissioning/Cold Start-up Purge

S.No.	Description	Model ID	Type	Emissions as % of Design	Modeled Exhaust Parameters				Modeled Emission Rates (g/s)		
					Stack Height (m)	Exit Temp (K)	Exit Velocity (m/s)	Stack Diameter (m)	NO2	SO2	CO
1	Feed Heater	EU-2001	point	50%	60.96	547	5.74	1.6	0.3235	0.0144	0.291
2	Treat Gas Heater	EU-2002	point	50%	60.96	480.4	5.70	0.96	0.133	0.00595	0.12
3	Vac Column Feed Heater	EU-2003	point	50%	60.96	699.8	5.70	0.48	0.023	0.001	0.0205
4	Fractionator Feed Heater	EU-2004	point	50%	60.96	488.7	5.68	1.67	0.393	0.0175	0.3535
5	TGTU Stack A	EU-3001	point	50%	60.96	549.3	6.05	1.118	0.422	0.788	0.095
6	TGTU Stack B	EU-3002	point	50%	60.96	549.3	6.05	1.118	0.422	0.788	0.095
7	HP Flare	EU-4006	point	Scenario Flaring	45.72	1273	20.00	2.03 (Eff. Dia)	0.707	10.405	3.798
8	LP Flare	EU-4005	point	Pilot and Purge	45.72	1273	20.00	0.4 (Eff. Dia)	0.056	0.0015	0.3024
9	Sulfur Block Flare	EU-4004	point	Pilot and Purge	45.72	1273	20.00	0.1 (Eff. Dia)	0.007	0.0087	0.0002
10	Loading Flare	EU-4001	point	Pilot and Purge	45.72	1273	20.00	0.1 (Eff. Dia)	0.007	0.0087	0.0002
11	Package Boiler	EU-6000	point	50%	30.48	477.6	5.815	1.07	0.1715	0.00765	0.1555
12	Emergency Diesel Generator	EU-6006	point	0%	4.72	683.2	0.00	0.406	0	0	0
13	Emergency Diesel Fire Water Pump	EU-6008	point	0%	4.72	683.2	0.00	0.406	0	0	0
14	Coal Milling and Drying Heater	EU-1007	point	50%	45.72	547	7.65	0.914	0.1405	0.0063	0.1265
15	Hydrogen Plant 1 Reformer	EU-7001	point	50%	50	432.6	5.79	3.45	0.3465	0.0172	1.0565
16	Hydrogen Plant 2 Reformer	EU-7002	point	50%	50	432.6	0.00	3.45	0.3465	0.0172	1.0565
17	Hydrogen Plant 1 DA Vent	EU-7003	point	50%	24.39	379.8	2.18	0.51	---	---	0.0737
18	Hydrogen Plant 2 DA Vent	EU-7004	point	50%	24.39	379.8	2.18	0.51	---	---	0.0737
								Total =	**3.5**	**12.09**	**7.62**
	Flaring Event 2 Details:										
	Flare Heat Release Rate, cal/s =		5.7E+06								
	Flared gas molecular Weight, lb/lbmol =		33.15								
	Flare Effective Stack diameter, m =		2.03								

3. Flaring Event 3 – VCC Unit Product Stripper Commissioning/Cold Start-up Purge

In addition to the HP Flare, the following sources will be operating at reduced capacities during this planned flaring event.

Table 3: Planned Flaring Event 3 – VCC Unit Product Stripper Commissioning/Cold Start-up Purge

S.No.	Description	Model ID	Type	Emissions as % of Design	Modeled Exhaust Parameters				Modeled Emission Rates (g/s)		
					Stack Height (m)	Exit Temp (K)	Exit Velocity (m/s)	Stack Diameter (m)	NO2	SO2	CO
1	Feed Heater	EU-2001	point	50%	60.96	547	5.74	1.6	0.3235	0.0144	0.291
2	Treat Gas Heater	EU-2002	point	50%	60.96	480.4	5.70	0.96	0.133	0.00595	0.12
3	Vac Column Feed Heater	EU-2003	point	50%	60.96	699.8	5.70	0.48	0.023	0.001	0.0205
4	Fractionator Feed Heater	EU-2004	point	50%	60.96	488.7	5.68	1.67	0.393	0.0175	0.3535
5	TGTU Stack A	EU-3001	point	50%	60.96	549.3	6.05	1.118	0.422	0.788	0.095
6	TGTU Stack B	EU-3002	point	50%	60.96	549.3	6.05	1.118	0.422	0.788	0.095
7	HP Flare	EU-4006	point	Scenario Flaring	45.72	1273	20.00	3.62 (Eff. Dia)	2.419	48.775	12.476
8	LP Flare	EU-4005	point	Pilot and Purge	45.72	1273	20.00	0.4 (Eff. Dia)	0.056	0.0015	0.3024
9	Sulfur Block Flare	EU-4004	point	Pilot and Purge	45.72	1273	20.00	0.1 (Eff. Dia)	0.007	0.0087	0.0002
10	Loading Flare	EU-4001	point	Pilot and Purge	45.72	1273	20.00	0.1 (Eff. Dia)	0.007	0.0087	0.0002
11	Package Boiler	EU-6000	point	50%	30.48	477.6	5.815	1.07	0.1715	0.00765	0.1555
12	Emergency Diesel Generator	EU-6006	point	0%	4.72	683.2	0.00	0.406	0	0	0
13	Emergency Diesel Fire Water Pump	EU-6008	point	0%	4.72	683.2	0.00	0.406	0	0	0
14	Coal Milling and Drying Heater	EU-1007	point	50%	45.72	547	7.65	0.914	0.1405	0.0063	0.1265
15	Hydrogen Plant 1 Reformer	EU-7001	point	50%	50	432.6	5.79	3.45	0.3465	0.0172	1.0565
16	Hydrogen Plant 2 Reformer	EU-7002	point	50%	50	432.6	0.00	3.45	0.3465	0.0172	1.0565
17	Hydrogen Plant 1 DA Vent	EU-7003	point	50%	24.39	379.8	2.18	0.51	---	---	0.0737
18	Hydrogen Plant 2 DA Vent	EU-7004	point	50%	24.39	379.8	2.18	0.51	---	---	0.0737
								Total =	**5.21**	**50.46**	**16.3**
	Flaring Event 3 Details:										
	Flare Heat Release Rate, cal/s =		1.87E+07								
	Flared gas molecular Weight, lb/lbmol =		38.86								
	Flare Effective Stack diameter, m =		3.62								